414/2 /FAPS/23- -47/5,000

DELHI POLYTECHNIC

LIBRARY

CLASS NO. 630

BOOK NO. D 20 V

ACCESSION NO. 15424

VEGETABLE CULTURE

A PRACTICAL MANUAL

BY

H. C. DAVIDSON

NATIONAL
SERVICE
EDITION

LONDON
THE TECHNICAL PRESS LTD
5 Ave Maria Lane, Ludgate Hill, E.C.4
1939

PREFACE

In the very heavy gardening correspondence which I have received during the many years I have been writing on the subject, no question has occurred more often than "Why should this or that be done?" In the present book, as in others published previously, I have endeavoured to answer the question. When the reason for any cultural direction is not obvious, it is given in the following pages.

To the vegetables ordinarily grown in gardens, a few others, treated more briefly, have been added. They are popular on the Continent, and deserve to be popular in this country. The more vegetables we have, the better. We want not merely quantity and quality, but also variety.

As they are all arranged in alphabetical order, it has not been considered necessary to insert an index. A glance at the List of Contents will show what is in the book, and where it is to be found.

The times mentioned for the different operations for each vegetable are those suitable for the neighbourhood of London. In the South they may be a little earlier, and in the North a little later. In the Calendar at the end, which may be useful as a reminder, the extreme limits are generally given. In most districts it will be prudent to keep well within those limits. Few gardeners can afford to take risks, and it is only rarely that crops sown very early are much in advance of those sown rather later, when the temperature is higher and growth consequently quicker.

BY THE SAME AUTHOR

Just Published, Crown 8vo, cloth, 162 pages, with 63 Illustrations especially drawn for the work. Price 5s. net.

THE CULTURE OF
POT PLANTS
In Rooms, Greenhouses, and Frames

LONDON: CROSBY LOCKWOOD & SON

CONTENTS

PAGE

Digging and Trenching—Choice of a Suitable Position—Food for the Crops—Economy of Crop Rotation—Crop Rotation and Disease—Drainage—Value of the Hoe—Thinning and Weeding 1
Artichoke, Chinese - - - - - - - 9
Artichoke, Globe - - - - - - - 10
Artichoke, Jerusalem - - - - - - - 13
Asparagus - - - - - - - - 16
Bean, Broad - - - - - - - - 21
Bean, Dwarf, French or Kidney - - - - - 24
Bean, Runner - - - - - - 27
Beet - - - - - - - - - 30
Borecole, see Kale.
Broccoli - - - - - - - - 35
Brussels Sprouts - - - - - - - 39
Cabbage - - - - - - - - 41
Cardoon - - - - - - - - 45
Carrot - - - - - - - - 46
Cauliflower - - - - - - - 52
Celeriac - - - - - - - - 54
Celery - - - - - - - - 55
Chicory - - - - - - - - 61
Chive - - - - - - - - 61
Corn Salad - - - - - - - - 61
Cress, and Mustard - - - - - - - 62
Cucumber - - - - - - - - 63
Cucumber, Ridge - - - - - - - 69
Endive - - - - - - - - 69

	PAGE
Herbs— Balm—Borage—Marjoram—Mint—Rosemary—Sage—Savory—Tarragon—Thyme	71
Horse-Radish	73
Kale or Borecole	75
Kohl Rabi	76
Leek	77
Lettuce	81
Maize	85
Marrow	87
Mercury	89
Mushroom	90
Mustard, see Cress.	
Onion	9
Parsley	101
Parsnip	10
Pea	104
Potato	108
Radish	118
Salsafy and Scorzonera	120
Seakale	122
Shallot	126
Spinach	126
Tomato	128
Turnip	134
VEGETABLE CALENDAR	138

LIST OF ILLUSTRATIONS

IG. PAGE
1. Trenching - 2
2. Plants with their Roots in Different Spits - 5
3. Carrots Thinned and Unthinned - 8
4. Chinese Artichoke - 9
5. Globe Artichoke - 11
6. Jerusalem Artichokes in Rich Soil and in Poor - 14
7. Asparagus Starting to Grow - 18
8. French Beans under a Crust of Hard Soil - 25
9. Runner Beans Staked - 29
10. Beet—Turnip-Rooted and Tapering-Rooted - 32
11. Raking along Rows of Seeds - 36
12. Home-Made Seed Protector - 37
13. "Heeling down" Broccoli to Protect it from Frost - 38
14. Brussels Sprouts, the Tops Protecting the Sprouts - 40
15. Club-Root in a Cabbage - 43
16. Black-Rot of Cabbage - 44
17. Cardoon - 45
18. Holes made in Heavy Land for Carrots - 48
19. Carrot Fly and Larva - 50
20. Wireworm, Leather-Jacket, Millipede, and Centipede - 51
21. Pricking out Seedlings in a Box - 53
22. Celeriac - 54
23. Earthing up Celery - 58
24. Celery Fly and Grub - 59
25. Home-Made Propagator for Seeds - 64
26. Cucumber Stopped at the First Leaf beyond the Fruit - 65
27. Cucumber Knot-Root Disease - 68

FIG. PAGE
28. Endive (Blanching) - - - - - - 70
29. Horse-Radish for Planting - - - - - 74
30. Kohl Rabi - - - - - - - 76
31. Planting and Earthing Up Leeks - - - - 79
32. Lettuces, Cabbage and Cos (tied up) - - - - 82
33. Surface Caterpillars - - - - - - 84
34. Cobs of Maize - - - - - - - 86
35. Mushroom Bed - - - - - - - 92
36. Inserting Mushroom Spawn in the Lawn - - - 94
37. Laying Onions with the Back of the Rake - - - 97
38. Onion Fly and Maggot - - - - - - 98
39. Parsnip Root Forked among Manure, and another Straight growing down to Manure - - - - - - 103
40. Stakes for Peas - - - - - - - 107
41. Potato Cut into Sets - - - - - - 110
42. Sprouting or Boxing Potatoes - - - - - 112
43. Black Scab of Potatoes - - - - - - 114
44. Potato Tuber affected by ordinary Scab - - - - 115
45. Potato Leaf Diseased - - - - - - 116
46. Seakale Pot - - - - - - - 123
47. Seakale Blanched and Cut - - - - - 124
48. Cluster of Shallots - - - - - - 125
49. Outdoor Tomato carrying Two Bunches - - - - 130
50. Tomato Roots attacked by Eelworms - - - - 132
51. Club-Root of Turnip ("Finger-and-Toe") - - - 135

VEGETABLE CULTURE

INTRODUCTION

FOR the successful cultivation of vegetables it is necessary that the soil should be in good condition ; that the position for each crop should be suitable ; that the seed should be sown at the right time and in the right way ; that the plants should be allowed ample space for growth ; and that other details should be attended to, such as hoeing, weeding, protecting from pests and diseases, feeding, and watering in dry weather. Most of these matters are dealt with in connection with the various vegetables, but a few general statements may be made here.

DIGGING AND TRENCHING

If the ground is to be in good condition for sowing in spring it should be dug or trenched in autumn or winter, and left rough, so that the weather may act on it and pulverise it. This is important for all soils, but especially for clay or heavy loam. Digging consists in turning over the top spit to the full depth of the spade or fork. It may be sufficient for shallow crops, but not for those with deeper roots. In trenching, the plot is divided by a line down the middle. A strip, about 2 ft. broad, of the top spit is then taken off one end of the first half and wheeled to the same end of the second half. A strip, 1 ft. broad, of the second spit is treated in the same way, the two heaps being kept separate. This is merely preparatory work. When it is completed, the exposed third spit is broken up and mixed with vegetable refuse if any is available, the exposed second spit is turned on to it, and a strip of the top spit is laid over it. Thus all three spits are left in their original order. If manure is added, as in most cases it should be, it is placed between the second spit and the top one. The task proceeds in the same way to the further end of the first half of the plot where soil from the corre-

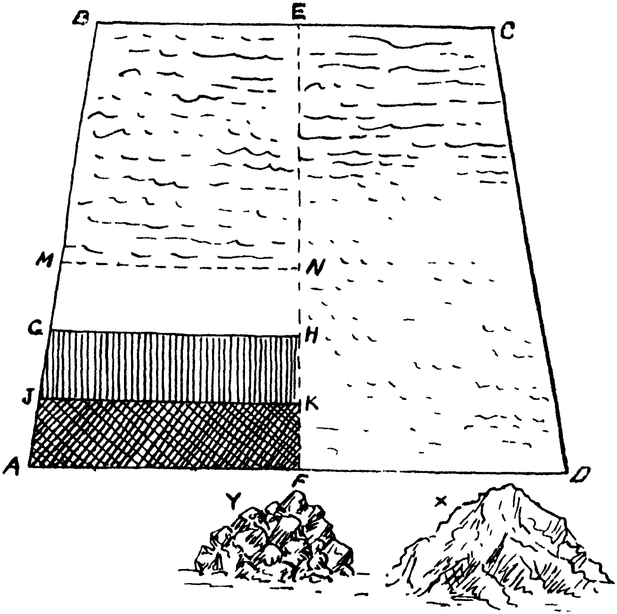

FIG. 1.—Trenching.

Plot A B C D divided down the middle by E F; heap X the top spit of G F, and heap Y the second spit of J F. First the second spit of G K is placed on J F, and then the top spit of M H is turned over it.

sponding end of the second half is used for filling up, and is continued backwards along the second half to the starting line, where it is finished by means of the two heaps.

In trenching grass land it is necessary to proceed rather differently—to change the order of the second and top spits, putting the latter below (upside down) and the former above; but in the following year, when the turf is dead, it should be brought up again, for it is the richest portion of the soil.

After trenching, as already stated, the surface should be left rough, preferably in ridges, so as to expose as large an area as possible. As the result of the action of frost, rain, and wind, the lumps crumble, and in spring the ground can be raked fine and smooth. It should on no account be dug again then, as that would bring other lumps to the top. But the fork may be used for levelling if it is not inserted too deep.

THE CHOICE OF A SUITABLE POSITION

When the ground has been prepared and the time for sowing or planting arrives, the most suitable position for each crop has to be determined. Some grow best in full sunshine, others in partial shade; some in fairly heavy soil, others in light; some require much moisture or much food, others comparatively little; some are more liable to be affected by disease in certain situations than others. How are these various requirements to be satisfied? In a small garden, where the conditions are nearly the same throughout, this is difficult in many cases, but in a large one there are often differences of soil or moisture which may influence the result. As regards shade, some can be provided for such plants as lettuce and spinach by growing them between rows of tall peas or beans.

FOOD FOR THE CROPS

The food contents of the ground depend on the amount not utilised by the previous crop, the amount added subsequently, and the retentiveness of the soil. Sandy soil is called hungry because any soluble food in it quickly drains away, and must be repeatedly replaced if growth is to be satisfactory; clay or loam is much more retentive, and consequently needs less manure. In many old gardens the ground contains a large quantity of food, but it is locked up in a form in which it cannot be used by the crops. In such cases it can be released by the addition of lime—at the rate of about 50 bushels to the acre. But just because lime has this effect, it should not be applied to any land more often than once in six or seven years, and never to sandy soil, which might be emptied of all its food contents at once and permanently impoverished.

The principal ingredients in plant food are phosphate, potash, and nitrate. All these occur in stable manure, but not in the proportion in which they are used by the plants. It is, therefore, best supplemented by artificial fertilisers which will supply any deficiency. As it does not become a plant food until it is decomposed and rendered soluble, it should be dug in, when fresh, during the autumn or winter so that it may be ready in spring and summer; but when decomposed it may be applied during growth. Similarly, artificial fertilisers which dissolve very slowly, such as basic slag and kainit, should be applied during the preparation of the ground in autumn or winter, and those which are readily soluble, such as nitrate of soda and sulphate of ammonia, when they can be used at once—that is, while the crops are growing. As these very soluble substances begin to sink as soon as they are dissolved, it follows that they should be distributed on the surface rather than dug into the ground. The crop for which they are intended has then more time to use them before they get beyond the reach of the roots.

Observation and experience will generally enable a gardener to decide whether to manure or not. He knows the nature of his land and what was previously grown in each plot, and he can watch the effect of any manurial addition. If it improves growth, the plants were obviously in need of it; if it does not, they had as much as they required. In the latter case, to increase the amount would be not only wasteful, but also possibly harmful, for excess of food is a poison.

THE ECONOMY OF CROP ROTATION

Much depends on the previous crop. If it consisted of large bulky plants it must have taken much food out of the ground; if of small plants, it may have taken very little. Hence the importance of a rational system of rotation. Though phosphate, potash, and nitrate are necessary for all plants, they enter into the composition of different species in different proportions. If, therefore, the food in the ground

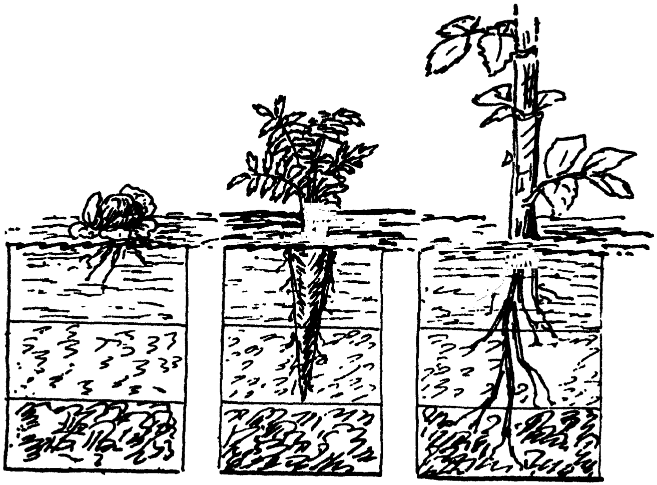

FIG. 2.—Plants with the roots in different spits—Lettuce (left) in the top spit, Parsnip (middle) in the second spit, and Broad Bean in the third spit.

is to be utilised to the fullest extent, a crop which requires, say, much phosphate and little potash should be followed by one which requires little phosphate and much potash. Moreover, if one, being deep-rooted, draws most of its food supplies from the second and third spits, it should be followed by another whose roots will be mostly confined to the top spit. This is managed in a general way by selecting for succession crops which differ as much as possible from one another.

CROP ROTATION AND DISEASE

There is another reason for crop rotation besides economy. The majority of insect pests, and especially of fungoid diseases, attack only certain kinds of plants, or at least certain genera, each confining itself to one kind or one genus. When the crops are gathered, the insects in the larval or pupal stage and the fungi in the germ stage remain in the ground, awaiting their particular food in the following season. If a different kind of crop is grown, one which they do not attack, they are starved, and if their food is withheld long enough they are exterminated. In many cases this can be done in a single year, but the germs of some fungi may remain dormant in the soil for several years, and when they are present the crops which they attack should not be grown again on the same plot during that period. Crop rotation, therefore, is useful not only in economising food, but also in preventing diseases. Other preventive measures, such as spraying, are mentioned in connection with the various vegetables.

DRAINAGE

Though plenty of moisture is essential for successful cultivation, wet land is more or less useless until it has been drained. This can sometimes be done by laying down pipes and connecting them in suburban gardens with the house system, or in the country with a ditch or a pond, made, if necessary, for the purpose. But the work is so troublesome and costly that few tenants would care to undertake it. Trenching, however, will greatly improve such land, for it allows the surface water to sink to a lower level, and if such rubbish as broken crockery, clinkers, and so forth is placed at the bottom of the trench, the improvement will be permanent.

THE VALUE OF THE HOE

For excessively dry land plenty of stable manure is the best remedy. Hence its importance in a hot, rainless summer. The food which it contains is useless to plants until it has been dissolved, and this is rendered possible by its retentive nature, the loss of its moisture by drainage and evaporation being consequently slow. Here, too, the hoe is most valuable. Apart from its use in destroying weeds, it breaks up the surface and, by leaving a loose top layer free from the air channels, which always form after soil has settled down for a time, checks the upward escape of the water underneath. By means of the hoe, a great deal of the labour of watering in a dry season can be saved. It also serves two other purposes—keeps insects on the move and exposes them to birds, and lets into the ground the air, without which the roots could not grow.

THINNING AND WEEDING

Of the other points mentioned as necessary for the successful cultivation of vegetables, only one calls for notice here—the importance of allowing them sufficient space for growth. Seed is almost invariably sown far too thickly, and even when it is not, the seedlings, as they develop, soon require more room than they did at first. To leave them so would be to spoil them. Plants need light, air, food, and moisture, and when they are crowded by one another, or by weeds, they cannot get enough of each of their requirements, the result being that they are stunted in growth, while roots that should be long and straight fork in all directions; they must therefore be kept free from weeds, and must be thinned or pricked out early. If they are starved at the beginning of their existence, they have not time afterwards to recover, and are permanently spoiled. Thinning should be done while the ground is moist. If it is very dry at the time, the plants left to grow are liable to be disturbed. Hoeing, on the other hand, should be done on a sunny day, in order that the weeds may be dried up and killed.

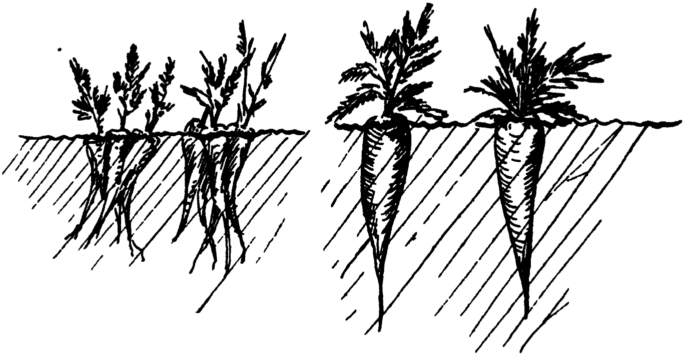

FIG. 3.—Carrots thinned and unthinned.

ARTICHOKE, CHINESE

(*Stachys tuberifera*)

This is one of the newest of our vegetables, for it was not introduced into this country until 1888. A native of China

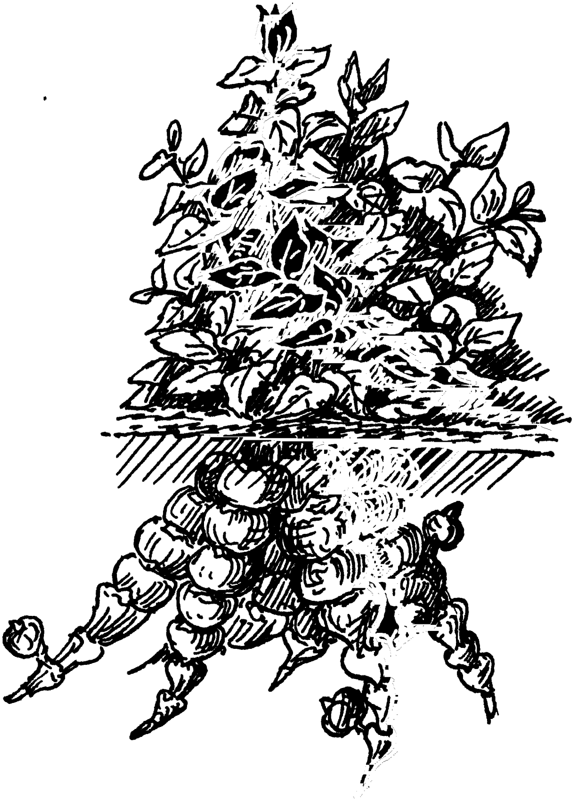

FIG. 4.—Chinese Artichoke.

and Japan, it is quite hardy. It is one of the Labiates, and is related to several of our common weeds—hedge woundwort (*S. sylvatica*), wood betony (*S. betonica*), and various others. It is called an artichoke merely because its tubers bear some resemblance to those of the Jerusalem artichoke. They are much smaller, however, and look as if they were strung together on the roots, their size decreasing gradually towards the tips. It cannot be said that they are popular in the kitchen, for they are troublesome to peel, an operation which involves a good deal of waste. Yet as they contain over 16 per cent. of carbohydrates (sugar, starch, etc.), they have a comparatively high food value.

Preparation of the Ground.—The ground should be prepared in autumn as for Jerusalem artichokes, but need not be so deeply dug.

Cultivation.—As seed is not produced in this country, Chinese artichokes must be propagated by means of the tubers. They should be planted in March, about 1 ft. apart, with 18 or 20 in. between the rows. In all other respects the cultivation should be the same as for Jerusalem artichokes. As the tubers discolour when exposed to the air, they should be left in the ground until they are wanted. They are not injured by frost. Their season commences in October.

ARTICHOKE, GLOBE

(*Cynara scolymus*)

The Globe artichoke is a herbaceous perennial, not quite hardy in England—at any rate, in the north. In spite of its specific name, it is not really a distinct species, but merely a variety of *Cynara cardunculus*, the Cardoon. Its cultivation goes back to a very distant period, though it is not always easy to decide to which of the two plants the old writers refer. Theophrastus, who lived between 300 and 200 B.C., was probably alluding to the Globe artichoke when he wrote that

"The head of scolymus is most pleasant, being boiled or eaten raw, but chiefly when it is in flower, as also the inner substance of the heads is eaten." It is a native of the countries bordering on the Mediterranean. The fact that it comes from a warm climate is indicated by the greyish down which serves as a protection against extreme heat, and this fact should be borne in mind when choosing a position for it. The date of its introduction into Britain is given as 1548.

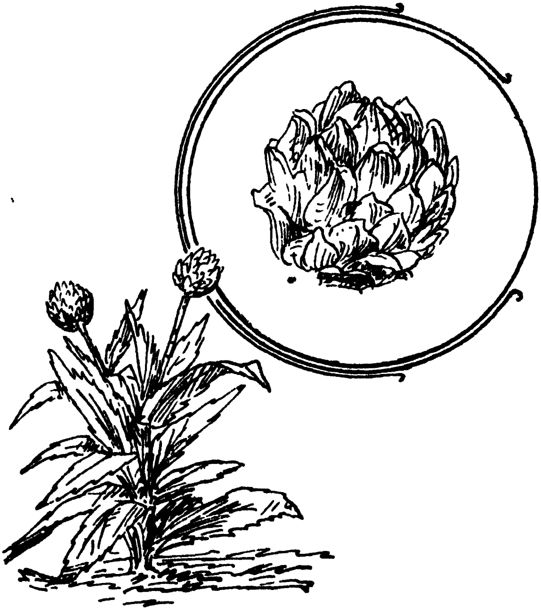

FIG. 5.—Globe Artichoke.

Varieties.—There is a purple as well as a green variety. The latter is generally preferred.

Preparation of the Ground.—Fairly light, deep soil in a sunny, open position is the most suitable for Globe artichokes. It should be trenched in autumn, and some partly decomposed manure dug in. If it is naturally heavy and wet it should be lightened by the addition of grit such as road scrapings, and drained. If left in rough ridges until spring, it will then crumble better, and can be raked smooth.

Propagation.—Though Globe artichokes can be grown from seed (sown in a prepared bed in March, the seedlings being afterwards treated like offsets), this method is not very often employed. For one thing, it involves a loss of time; for another, the seedlings vary in quality, but must be grown to flowering size before the poor ones can be weeded out. It is customary, therefore, to use offsets or suckers for the purpose. Unless they can be obtained from established plants in the garden, they should be ordered from a nursery for delivery at the end of April. They should be provided with good roots, and if some soil is still attached to them, they will be the more likely to make an early start.

Cultivation.—As Globe artichokes under good treatment grow large and tall, often 6 ft. in height, they require plenty of space. The usual distances are 3 ft. between the plants, and from 3 to 4 ft. between the rows. Water should be given in dry weather, and liquid manure about once a fortnight during the summer. In the first year the crop is never large. But any heads that are produced should be gathered as soon as they are ready, the stems cut close to the base, otherwise they weaken the plants. In autumn the ground should be forked over, and a mulch of manure or litter should be laid over it to protect the young growth, which appears when the old dies. In very severe weather it may be necessary to cover this young growth with straw, or preferably with bracken, which is less likely to be flattened down by rain or snow. In the following season there should be a full crop (probably produced during the months of August, September, and October), and this will continue for two or three years, when a fresh bed should be made, as the plants deteriorate.

In the well-known experiments at Hadlow, carried out by Dr Dyer and Mr Shrivell, to which frequent reference will be made in this book, potash was found to be essential to Globe artichokes. It increased the crop enormously, and also brought it on much earlier—an important matter, especially for market purposes. The best and most economical winter dressing per acre proved to be twenty-five loads of stable manure, with 4 to 6 cwt. of superphosphate, and either 1 cwt. of sulphate of potash or 4 cwt. of kainit, from 2 to 4 cwt. of nitrate being applied during growth in spring or early summer. This may be taken as equivalent to, per 10 sq. yds.—half a barrowload of manure, from 1 to 1½ lbs. of superphosphate, 4 oz. of sulphate of potash or 1 lb. of kainit, and from ½ to 1 lb. of nitrate of soda (or rather less of sulphate of ammonia).

Pests and Diseases.—Globe artichokes are sometimes attacked by a fungoid disease known as leaf-blotch. It is characterised by numerous greyish spots, which bear some resemblance to mildew. As it develops the spots coalesce, and if heads are formed they are imperfect. No cure is known. All infected plants should be dug up and burned as soon as the disease is noticed. If any grubs are found to be injuring the roots, a soil fumigant, such as bisulphide of carbon, should be used.

ARTICHOKE, JERUSALEM

(*Helianthus tuberosus*)

The tale is told of a famous journalist that, having to write about this plant, he looked up both "Jerusalem" and "Artichoke" in a cyclopædia and, by combining the information thus obtained, produced a most entertaining article. This is probably a fable, for the Jerusalem artichoke is not an artichoke, and has no connection with Jerusalem. The popular name is supposed to be a corruption of the Italian *Girasole articocco*, meaning Sunflower artichoke. The earliest book in which it occurs is Parkinson's "Paracelsus," published in 1629.

As the botanical name implies, the plant is really a tuberous-rooted sunflower. In this country, into which it was introduced at the beginning of the seventeenth century, it bears its yellow flowers only in an exceptionally hot summer—it has flowered with me only once in a period of forty years—so it is evidently a native of a much warmer climate; and though it now grows wild in many parts of Canada, it was probably brought there from the South by Indians, some of the tribes having long grown the tubers for food.

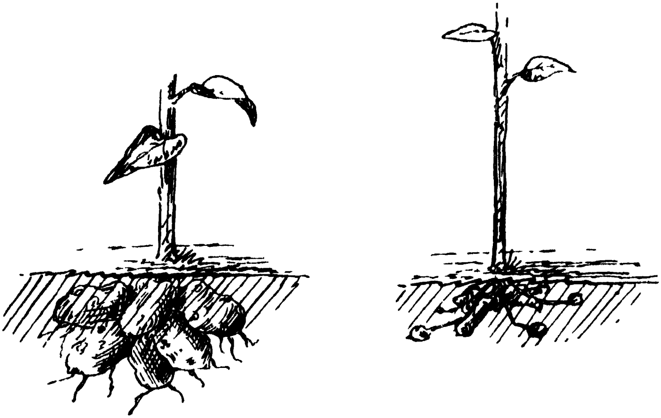

FIG. 6.—Jerusalem Artichoke in rich soil (left) and in poor soil (right).

The tubers contain between 14 and 15 per cent. of carbohydrates, as against nearly 20 per cent. in those of the potato; but whereas in the latter the carbohydrates consist mainly of starch, in the former there is, instead of starch, another substance called inulin as well as a gummy principle, levulin, and a large amount (4 per cent.) of sugar. It is to the starch that potatoes, when boiled, owe their mealiness. As the result of its absence, Jerusalem artichokes are not mealy, but waxy.

Preparation of the Ground.—Like many other members of the Sunflower family, Jerusalem artichokes are so vigorous that they are able to grow even under the most unfavourable conditions. They are therefore often planted in an out-of-the-way corner, and a few roots dug up as required, the others being left from year's end to year's end to manage as best they can, without any real thinning, weeding, or manuring. When they are treated in this manner, the tubers become small and so misshapen that they cannot be peeled without great waste. It pays to cultivate them well. In autumn or winter the ground selected for them should be deeply dug and manured. In the Hadlow experiments artificial fertilisers, especially potash, greatly increased the crop, but the best results were obtained from stable manure, which may be used at the rate of half a barrowload or rather more per 10 sq. yds.

Propagation.—By means of the tubers. If large, they may be cut, like potatoes, in pieces, each with one or more eyes.

Cultivation.—They should be planted 4 in. deep and 18 in. apart, with 2½ ft. between the rows. At these distances it will be easy to use the hoe among them during the summer. As the stems grow very tall, they are sometimes shortened. This must check development to some extent, but it may be done if there is a chance of their being blown down. At the end of the season, when the foliage withers, they should be cut down. The tubers are then ready for use. As they are not injured by frost, they may be left in the ground until they are wanted, or they may be lifted and stored. Not later than the end of February they should all be lifted. Any that are likely to be required for cooking should be put away dry in a shed. If they remained longer in the ground they would begin to grow, and would then turn black. The others should be planted as described above—preferably in fresh ground, previously prepared for them.

Jerusalem artichokes are rarely attacked by any insect or disease.

ASPARAGUS

(*A. officinalis*)

Asparagus is a member of the Lily family. The word, of which the rustic "sparrow-grass" is obviously merely a corruption, is derived from the Greek name for the genus, and signifies "to tear badly," in allusion to the prickles of some species. The common asparagus is quite hardy, for it is a native of this country, though it is probably no longer to be found in the districts—Dorsetshire, Cornwall, and the west coast of Ireland—in which it formerly grew. On the steppes of Russia there are large colonies of it. As a wild plant, however, it is insignificant, the shoots being very thin, and barely 1 ft. in height. The increase in size in gardens is due to long cultivation in rich soil, and under favourable conditions; but this character, though it may now be regarded as hereditary, soon tends to deteriorate if the plants are starved. As far back as the times of the Romans, with whom asparagus was a favourite delicacy, it was very carefully cultivated. Pliny tells us that the dead stems, after they had been cut down at the end of the season, were burned, and that the beds were manured with the ash. As the ash contains potash (a fertiliser which has a marked effect on the growth), it will be seen that the Roman method was an excellent one.

The food value of asparagus is small. It contains only about 2 per cent. of albuminoids, less than 3 per cent. of sugar and starch, and ¼ per cent. of fat, most of the remainder (93 per cent.) being water. It is valued merely for its delicate flavour, though a principle in it called asparagin is supposed to be useful in such complaints as rheumatism and gout.

Varieties.—Connover's Colossal and Giant are both large and good.

Preparation of the Beds.—As asparagus is intended to occupy the ground for many years, the site for it should be prepared with special care. This should be done in autumn or winter. If the soil is very heavy and wet, it should be lightened by the admixture of sand or grit, and drained by digging in a layer of broken bricks or stones; if very light and dry, it should be made firmer and more retentive of moisture by means of loam. In either case it should be trenched, and a large quantity of decomposed stable manure should be added. A barrowload every 5 sq. yds. would not be too much. The beds are sometimes made on the flat, but more often in private gardens they are raised, the usual breadth of each being 5 ft., with alleys 1 ft. broad between them. After the beds have been marked out, the soil from the alleys, to a depth of 6 or 8 in., should be thrown out on top of them and levelled. A bed of the breadth mentioned will contain three rows of plants, the first row 1 ft. from the nearer alley, the second 18 in. from it, and the third 18 in. from the second and 1 ft. from the farther alley.

Propagation.—If asparagus is to be grown from seed, no great quantity will be required for an ordinary garden. An ounce should provide enough plants for a row nearly 400 yds. in length. In order to assist germination, it should be obtained in March, mixed with sand (which should be kept moist), and placed in a cold frame or greenhouse, or in a shed. About the end of April it should be sown thinly (with the sand) in a prepared bed of light, rich soil, the drills being drawn 2 in. deep and 1 ft. apart. As the seedlings grow they will require more space, and should be gradually thinned until they are about 4 in. apart. Weak liquid manure should be given to them once a fortnight during the summer, and they should be watered, when necessary, and kept free from weeds. In the following April they may be transferred to the permanent beds. As a rule, however, plants are bought from a nursery, because of the saving of time.

Cultivation.—They should be obtained early in April, for as they are then beginning to grow, they have more vitality than when they are dormant, and there is less risk of failure. The fleshy roots rapidly lose moisture and wither when they are exposed to the air, so the sooner they are in the ground the better; for which reason if good plants can be procured at a nursery in the neighbourhood, it is advisable to order them from it, rather than from another a long way off, which would necessitate a tedious railway journey. Plants either two or three years old are generally preferred. If they are older, they do not move so well; if they are younger, there is a long period of waiting before they become useful. They should be planted in broad drills, 4 or 5 in. deep, the distance between the plants being 18 in., the same as the distance between the rows.

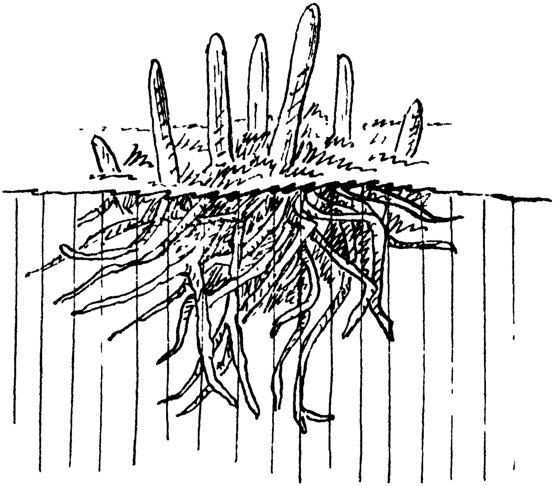

FIG. 7.—Asparagus starting to grow.

Cutting should not commence until the plants are at least three years old, and for the first season it should be light. It should never be continued after the first week in June, for the plants cannot become strong if they are not allowed plenty of time to grow. While cutting is in progress, the best plan is to take all shoots of usable length, whether they are thick or thin, otherwise the plants, instead of being able to concentrate their energy on the production of young growth, must also provide food materials for the development of the older. Liquid manure at intervals during the summer will help them, and in dry weather the beds should be watered. When the foliage withers the soil should be forked over, and any that has fallen into the alleys should be thrown back, for their purpose is to drain the beds. All weeds should be cleared off, and a dressing of decomposed stable manure should be applied. The manure is useful in two ways: it not only supplies food for the following season's growth, but also protects the roots from severe frost.

In the Hadlow experiments, artificial fertilisers had a very pronounced effect on the growth of asparagus. The most economical dressing was found to be a moderate amount of stable manure (twenty-five loads per acre), supplemented by phosphate (either 8 cwt. of basic slag or 6 cwt. of superphosphate) and potash (1 cwt. of the sulphate or 4 cwt. of kainit), applied in autumn or winter, and from 4 to 6 cwt. of nitrate of soda applied during growth. This may be taken as approximately equivalent to, per 10 sq. yds.—half a barrowload of manure, 2 lbs. of basic slag or 1½ lbs. of superphosphates, and ¼ lb. of sulphate of potash or 1 lb. of kainit for the winter dressing; and from 1 to 1½ lbs. of nitrate of soda (or rather less of sulphate of ammonia) for the spring or summer dressing, the latter preferably given in two instalments at intervals of a month.

When potash was omitted there was a large decrease in the yield. As asparagus generally grows wild near the sea, it is a common practice to apply a dressing of salt in spring, waste salt from the fishmonger being often used for the purpose. In the same experiments it was found to have no influence on either the size of the shoots or on their number per acre. Apparently its only effect is to make them more succulent.

Forcing Asparagus.—With a greenhouse in which a temperature of 60° F. is maintained, it is easy to have asparagus during the winter. A few weeks before it is wanted, strong three-year-old plants should be procured. If they are to be taken from the garden, they should be lifted carefully, with as little breakage of the roots as possible. They should be packed rather closely in boxes containing some light, rich soil, with which the crowns should be only just covered. Any position will do for the boxes—even beneath the stage—if they are protected from drip. At first the soil should be only slightly moist, for dormant plants are liable to decay in the presence of much moisture; but afterwards, when growth commences, more water should be given. If a heated greenhouse is not available, a hot-bed can be used, provided that the lights are matted over on cold nights, and that the temperature is kept up by additions of fresh manure. After the plants have served their purpose, they are often thrown away; but if they are grown outside for a couple of years, they regain their strength and can be forced again.

Pests and Diseases.—Asparagus is remarkably free from pests and diseases. It is attacked only by two diseases—rust, and another fungus which destroys the roots—and by one insect—a small green beetle—and in this country they rarely do much damage. The fungus which causes asparagus rust is closely related to one which causes mint rust. It appears in the form of dark streaks on the shoots. All diseased shoots should be cut off as soon as possible—before the spores ripen and fall to the ground—and burnt, and the others should be sprayed with Bordeaux mixture. The fungus which destroys the roots is more difficult to deal with. When once it gets into a bed, the only way to save the plants which are still healthy seems to be to lift them, and saturate the soil with carbolic acid diluted with water (1 oz. of the former to 1 gal. of the latter), and to let several weeks elapse before replanting. In the case of all plant diseases, however, it should be remembered that there is always an inducing cause—generally too little food or water, or too much. This cause should be sought for and removed, otherwise even if a cure is temporarily effected, the disease is almost certain to break out again. As regards the one insect, the injury is not done by the beetle itself, but by its larvæ—small caterpillars. If they are few, they should be picked off by hand; if numerous, the plants when damp should be dusted with lime.

Fasciation, the growth of a shoot in the form of a flattened bundle, is not uncommon in asparagus. Some authorities consider that it is due to an injury to the shoots; but as it not infrequently appears year after year in the same plant, this seems unlikely. From the horticultural standpoint, fasciation is of little consequence, as the abnormal growths are too few to affect the crop.

BEANS, BROAD

(*Faba vulgaris*)

The Broad bean has been cultivated from such a remote period that its origin can only be conjectured. De Candolle expresses the opinion that it may have been derived from *Vicia narbonensis*, a vetch which is a native of the Mediterranean region and of Persia. It was known to the early Greeks, and also to the Egyptians, but, according to Heroditus, the latter did not eat it, and regarded it as "unclean." From specimens which have been found at Troy and elsewhere, it seems to have been little altered since then by cultivation, except in the size of the seeds and pods.

The food value of the Broad bean is high, but of course very much higher in the dried seeds than in the green. The latter contains nearly 5 per cent of albuminoids, and nearly 7 per cent of sugar and starch (carbohydrates).

Varieties —Green Windsor and Green Long pod are good green seeded varieties, and Johnson's Wonderful and Exhibition Long pod are good white seeded The hardiest is the Mazagan, sometimes sown in November

Preparation of the Ground —The most suitable soil is a good, deep loam, and except for an early crop, the position should be fairly cool As the plants make long taproots, they do not grow well in shallow soil, and in a hot position they are liable to be destroyed by aphis The ground should therefore be trenched and heavily manured in autumn—say at the rate of a barrowload to 10 sq yds Phosphate (2 lbs of basic slag or 1½ lbs of superphosphates) and potash (4 oz of the sulphate or 1 lb of kainit) may, with advantage, be applied at the same time The surface should be left in ridges, which should be levelled when the ground is wanted

Cultivation —A quart of seed is sufficient for a row of about 20 yds It is sometimes sown in November, or even in October, but little, if anything, is gained by commencing before January or February On the other hand, very late sowing is a mistake, for the plants have then to endure the heat of summer, and are sure to be infested with aphis If a succession is wanted, three sowings may be made—one in each of the first three months of the year After that the result is very uncertain

In private gardens Broad beans are usually grown in double rows, drilled with the hoe 4 in deep and 9 in apart The next double row should not be nearer than 2½ ft, but it is more economical to make the distance 5 or 6 ft, because other crops can then be grown in the intervening space, the most suitable for the purpose being those that are benefited by a little shade, like spinach and lettuce The seeds should be dropped about 4 in apart in the rows If they are arranged alternately, so that the plants in one row are opposite the gaps in the other, light and air will be more equally distributed. Finally the drills should be filled in by pressing into them the slight ridges with the back of the rake, and made smooth with the teeth. When the plants are about 1 ft. in height, a mulch is sometimes applied to keep the roots moist and cool; but this is not necessary if the hoe is used frequently and a little soil is drawn round the stems. In order to bring the first batch of plants into bearing as soon as possible, their tops should be pinched off when they have formed a few pods. The later plants should be treated in the same way when they are seen to be carrying a fair crop, or even before, if they are infested with aphis. Broad beans should be used while they are young and tender. It is true that their food value is then less than when they are older, but if they are allowed to get hard and tough-skinned, they are fit only for horses and cattle.

Pests and Diseases.—As the bean aphis, commonly known as black fly, always appears first on the soft young tips of the plants, their prompt removal generally effects a permanent clearance. They should be burned, and not left lying about. If, however, the insects have been allowed to spread, especially to the young pods, it will be necessary to spray with an insecticide, such as paraffin emulsion. Another insect, a tiny black beetle, is sometimes troublesome. It lays its eggs in the flowers, and the weevils eat their way into the seeds, where many of them remain as chrysalids during the winter. The presence of one can be detected by a transparent spot in the skin, caused by the tunnel underneath. If there is a hole instead of a transparent spot, the beetle has gone. All suspected seeds should be carefully examined. Any containing the insects should be burned, and others that are damaged should not be used for sowing. The commonest fungoid disease of Broad beans is rust, which shows as white, and at a later stage brown, patches on the leaves and stems. Spraying with a solution of liver of sulphur ($\frac{1}{2}$ oz. to 1 gal.

of water) is sometimes recommended; but there is little chance of curing any internal disease by an external application. In order to prevent the infection of subsequent crops, the haulm should be burned as soon as possible. This should also be done in the case of a sclerotium disease, which is characterised by white mould on the stems at the ground line, the plants gradually withering from bottom to top.

BEANS—DWARF, FRENCH OR KIDNEY

(*Phaseolus vulgaris*)

De Candolle is inclined to attribute a South American origin to the Dwarf bean. He says that most species of the genus are natives of South America, and adds that seeds apparently belonging to the species have been found in Peruvian tombs. Its susceptibility to frost is a sure sign that it must have come from a warm climate. Nevertheless, the Dwarf bean, or a species like it, was cultivated by the ancient Greeks, and is mentioned by Dioscorides and Aristophanes. It was called *Phaseolus* (which has been adopted as the name of the genus), and bore some resemblance to a small boat then in vogue (*phaselus*). Whether the boat was named after the plant or the plant after the boat, is uncertain. By the French the Dwarf bean is called *Haricot.* They grow it largely, but for its dried seeds, and not for its green pods.

The food value of the former is enormously greater than that of the latter. The dried beans contain about 23 per cent. of albuminoids as against less than 3 per cent. in the green pods, 2½ per cent. of fat as against a mere trace, and 54 per cent. of starch as against 8 per cent. In this respect the Dwarf bean stands highest in the vegetable kingdom except the lentil (*Lens esculenta*), which for some reason or other is rarely grown in this country.

Varieties.—Canadian Wonder, Ne Plus Ultra, Osborn's Forcing and Golden Wax-pod are all popular. The pods of the last can be cooked without cutting, the ends being merely trimmed off.

Preparation of the Ground.—As the plants are very tender, a slight frost being sufficient to destroy them, a warm and sheltered position should be chosen for them. Of course this is more important for early and late crops than it is for those in mid-season. The ground should be dug and manured in the ordinary way in autumn or winter, but no special preparation is necessary.

Cultivation.—A pint of seed is sufficient for a row quite 50 yds. in length. It is not safe to make the first sowing before the beginning of May. The best time must naturally vary with the weather and also with the district, being later in the north than in the south. Other sowings may follow at intervals, until the end of July. The drills should be drawn with the hoe 3 in. deep and 2 ft. apart, and the seeds should be about 4 in. apart. When they are sown close, as they often are, the plants are so crowded that they cannot grow properly, while thinning, always a wasteful proceeding which should be avoided if possible, is liable to disturb those that are left in the ground. Leguminous plants, such as beans and peas, are generally supposed, by the aid of the bacteria which cause the nodules on their roots, to be able to get from the atmosphere all the nitrogen they require. In the Hadlow experiments,

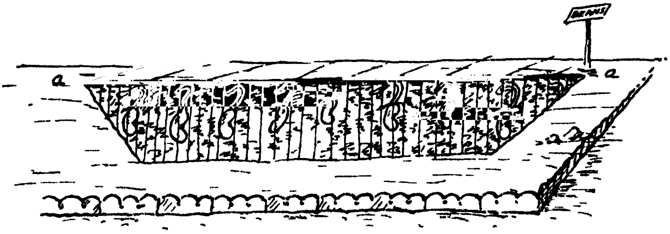

FIG. 8.—Dwarf Beans under a crust of hard soil.

however, it was found that 2 cwt. of nitrate of soda per acre applied during growth largely increased the crop of Dwarf beans. The pods should be gathered while they are quite young. If they are allowed to develop and mature seeds, the plants soon go out of bearing. In very dry weather they should be watered heavily, otherwise they may be attacked by red spider. The watering should be done in the evening, in order that the plants may have plenty of time to benefit by the moisture before it is dried up by hot sunshine. The first crop should be ready at the beginning of August. If clay soil is watered during strong sunshine, a hard crust is formed which young seedlings may be unable to break through.

Forcing.—In a greenhouse where a temperature of 60° F. is maintained, Dwarf beans can easily be grown in winter. Large pots (8 in.) should be used, and should be quite clean. A layer of broken crocks should be put in the bottom of each to serve as drainage, and the pots should then be filled with rich, sandy loam, made fairly firm. If the soil is rammed hard, it will not let the water pass through; if it is spongy, it will hold too much water. Three or four seeds should be sown in each pot. The most suitable position is a shelf near the glass. On sunny mornings, fresh air should be admitted freely. The soil should never be allowed to get dry. When the plants begin to form pods, they should be given every few days some weak liquid manure, which can be made by dissolving in water a little of any of the artificial fertilisers sold in tins. As the flowers do not set well in dull weather, it may be advisable to pass a camel-hair brush over them, in order to convey the pollen from one to another.

Pests and Diseases.—The only insects likely to prove troublesome are thrips and red spider. The presence of the latter—a tiny, reddish-brown insect which infests the lower side of the leaves—is always a sign that the plants have been kept too dry. Frequent spraying under the leaves may clear the pests away. If it does not, a solution of liver of sulphur

(½ oz. to 1 gal. of water) should be used. The same liquid is effective against thrips, a larger elongated winged insect, generally yellowish in colour. The sclerotium disease mentioned in connection with Broad beans has been known to attack Dwarf beans, but cases are not very common. In very stiff ground which has not been properly prepared, the curved, growing points of young plants, as they endeavour to straighten in passing through the soil, are sometimes broken. This is especially likely to happen when they have been injured by slugs. If these pests are numerous, coal ashes, fresh lime, or dry soot should be scattered along the rows. They will not crawl over coal ashes because of the sharp particles. Lime, as Miss Ormerod proved, does not kill them, but it makes them change their skins, so they keep away from it. Soot when dry adheres to their slimy bodies, and, by blocking their breathing pores, tends to produce suffocation; but when it is wet, it is useless. It must therefore be frequently renewed.

BEAN, RUNNER

(*Phaseolus multiflorus*)

The Runner bean or Scarlet Runner is regarded as merely a climbing variety of the Dwarf bean; yet it differs from the latter not only in its height, but also in its perennial habit and its tuberous root. That it is a true perennial can be proved by storing the roots in autumn under the same conditions as those of the Dahlia, and planting them again in May. They will soon begin to grow, and will produce an earlier crop than plants raised from seed. Probably the reasons why this method is not generally practised are that it involves some little additional trouble, and that earliness is no great advantage at a time when a similar crop—Dwarf beans—should be abundant.

The history of the Runner bean is comparatively short.

Nothing is known about the plant before the beginning of the seventeenth century. According to Parkinson, it was brought from the West Indies, and was first grown in this country by John Tradescant, who was gardener to Charles I., and was connected with the introduction of several other novelties, one of them—a genus of flowering plants—being named *Tradescantia* after him.

The food value of the Runner bean is the same as that of the Dwarf bean.

Varieties.—Best of All, Scarlet Emperor, and Tender and True are among the finest. Mont d'Or is a Wax-pod or Butter bean, the pods of which can be cooked whole, except for trimming of the ends.

Preparation of the Ground.—As the plants are tender, the position should be warm and sunny, if possible sheltered from strong winds. They are not infrequently grown over an arch, for the scarlet flowers are quite ornamental. Sometimes, too, they are used as a screen to hide an unsightly corner. As they are much more vigorous and taller than Dwarf beans, their roots go deeper, so the ground should be dug to a greater depth in autumn, or, preferably, trenched. At the same time it should be manured.

Cultivation.—A pint of the seeds is sufficient for a row 15 yds. in length. They should be sown in May (from the beginning to the middle of the month, according to the district), from 4 to 6 in. apart, in a drill 2 in. deep. Another sowing may be made in June. If there are two rows, the second should be at a sufficient distance from the first to allow of other crops being grown in the intervening space without being too much shut in. Soon after the plants appear, the stakes should be inserted. They should be strong. If they are old and brittle, they are worse than useless, for they are almost sure to give way later in the season, when there is much wind pressure on the fully-grown plants. They should be driven firmly into the ground in pairs, one on each side of the row, the two crossing near the top and tied there, and all the pairs connected by stakes laid along and fastened to the crossed tops. When so arranged they support one another. When the beans reach the top of the stakes they should be "stopped"; in other words, the growing points should be taken off. Unless this is done, they produce such a heavy mass of tangled growth up above that the whole may be brought down by the wind.

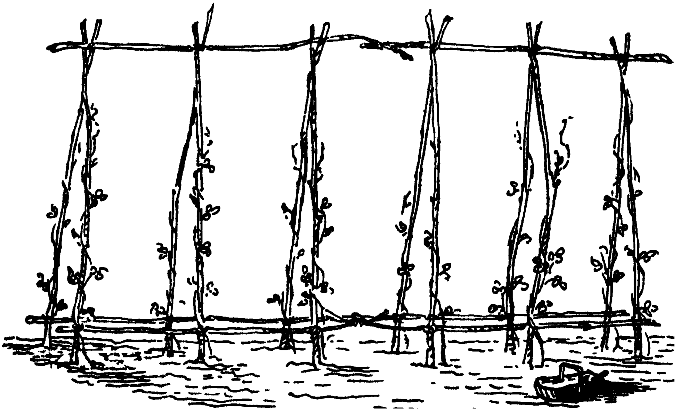

FIG. 9.—Runner Beans staked.

In some private gardens the stakes are inserted first, a few seeds being afterwards sown around each. In others, as in market gardens where so many stakes would be required that the cost would be prohibitive, Runner beans are kept dwarf. They are sown thinly in drills about 3 ft. apart, and as soon as they begin to "run," the tips are pinched off, the operation being repeated as often as may be necessary. When treated thus they form dense little bushes, and in time are covered with pods. Of course the crop is not as large as when they are tall, and it is more troublesome to gather; but the plants can be protected from frost with less difficulty, and the saving in stakes is considerable.

As regards manuring during growth, in the Hadlow experiments the application of 2 cwt. of nitrate of soda, which largely increased the crop of Dwarf beans, produced scarcely any effect on Runner beans. The difference is not easy to explain; but apparently, if the ground is properly prepared, the latter are able to obtain from it all the food they require, and are little, if at all, benefited by any subsequent dressing.

Runner beans sown in May should begin to bear in August. At the end of the season, before the foliage is blackened by frost, all pods still on the plants should be gathered. If they are tied together in bundles and put with their stalk ends in water, they will remain fresh for a week or ten days, or possibly rather more. For later use they should be placed in a pan or tub with alternate layers of coarse salt. They can then be cooked as required throughout the winter, though they lose, to some extent, both flavour and colour.

Pests and Diseases.—To the pests enumerated under Dwarf beans may be added millipedes—pale buff or black insects with many legs, and a habit of curling up in spirals. They are slow in movement, not swift like flesh-eating centipedes, which are also larger and have fewer legs. Millipedes sometimes bore into and partially excavate the seeds. Some of them can be trapped in pieces of carrot buried in the ground, but if they are numerous it may be necessary to use a soil fumigant, such as bisulphide of carbon.

BEET

(*Beta maritima*)

According to Lord Avebury in "British Flowering Plants," *Beta maritima*, a perennial which grows wild near the sea in some parts of Britain and of the Continent, is "the origin of the beetroot and the mangold-wurzel," and that seems to be the opinion of botanists generally. It is supported by the fact that seeds taken from the wild form and grown inland, where they were free from the influence of salt, have been proved to produce plants identical with those of the garden beet, except in size. The wild form has no thickened root. This has been induced by long cultivation in rich soil, the plants consequently absorbing more food than they could use, and storing the excess in their roots, much as the camel stores it in the hump, and the sheep in the tail. Yet, singularly enough, as late as the end of the sixteenth century, the parts eaten in this country appear to have been, not the roots, but the midribs of the leaves. "What might be made," says Gerard, "of the red and beautifull roote (which is to be preferred before the leaves as well in beautie as in goodnesse), I referre unto the curious and cunning cooke, who no doubt when he has had the view thereof and is assured that it is both good and holsome, will make thereof many and divers dishes both faire and good." The beet was cultivated by the Greeks. Pliny tells us that they had two kinds—white and black. When it was first used in Britain, is unknown. There was a red variety called the Roman, which is suggestive.

The food value of the beet lies almost entirely in its sugar contents, which amount to 10 per cent. of the whole. In the Sugar beet, a variety of the ordinary kind, the proportion is rather higher.

Varieties.—There are two distinct forms of cultivated beet—the globular or turnip-shaped, and the tapering-rooted. The former, being smaller than the latter, comes to maturity in a shorter time, and is therefore generally chosen for an early crop. It should always be preferred for shallow soil, in which the longer beet cannot be grown well. Globe Red and Egyptian are two popular varieties. Of the tapering-rooted class, Cheltenham Green-top is one of the best for private gardens—the leaves green, the roots shapely, not too long, and of excellent colour and flavour—and Dell's Crimson is a fine dark-leaved variety. In addition to the foregoing, there are Spinach beet and Seakale beet, both of them grown for the fleshy mid-ribs of the leaves, which are served like asparagus. In the case of the former, the leaves themselves are also cooked like spinach. Sugar beet should be grown in the same way as the others.

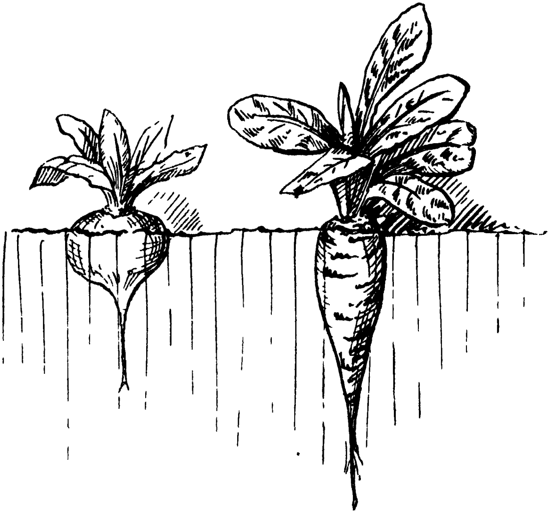

FIG. 10.—Beet—turnip-rooted (left) and tapering-rooted (right).

Preparation of the Ground.—Beet, especially when the longer kinds are grown, requires a considerable depth of soil, which should, therefore, be trenched in autumn or winter. It is a common practice to select a plot which was supplied with manure for the previous crop, and to add no more; but in the Hadlow experiments, superphosphate or basic slag was used with good effect. On light land potash is also beneficial, but on heavy land it does not seem to be required, the clay already containing enough. If stable manure is considered necessary, it should be dug in so that it will not be close to the roots, otherwise it is liable to cause forking. The soil should be raked fine and smooth before it is used.

Cultivation.—An ounce of seed is sufficient for a row 20 yds. in length. Globe varieties should be sown from the middle to the end of April in drills about 1 in. deep and 1 ft. apart, and the main crop in drills from 15 to 18 in. apart, about the middle of May. It is not advisable to sow earlier, because if the plants have a very long period for growth, they get excessively large and coarse. They should be thinned out to 6 or 8 in. apart. This can be largely done with the hoe, but must be finished by hand. Another method which is more economical is to sow three or four seeds in groups 8 in. apart in the rows, and when the seedlings are large enough to enable a selection to be made, to pull out all but one (the largest) in each group. Beet does not transplant well, but if there are any gaps, plants in the small seedling stage may be carefully lifted with the trowel, and moved into them. The hoe should be used frequently between the rows, and if sparrows seem inclined to peck the seedlings, as not infrequently happens, they should be kept away by means of black cotton stretched along the rows.

If 2 cwt. of nitrate of soda per acre (½ lb. per sq. yd., or rather less of sulphate of ammonia) is applied at the end of June or early in July, it will increase the weight of the roots. A light dressing of waste salt is sometimes given for the same reason as in the case of asparagus.

The early crop should be ready in August. In October the rest of the plants should be lifted, care being taken that they are not damaged in any way, otherwise in the process of boiling they will "bleed"; that is, lose colour. For the same reason the tops should not be cut, but should be twisted off about 3 in. from the crowns. The roots should then be stored in dry sand in a frost-proof shed. Straw can be used instead of sand; but is not so good, as it does not completely exclude the air, the result being that the roots lose moisture, and shrivel.

Pests and Diseases.—The beet, like the mangold-wurzel, is sometimes attacked by the grubs of a small black beetle, which destroy the leaves. If the damage threatens to be serious, the plants should be sprayed with a non-poisonous insecticide, such as paraffin emulsion; and in order to induce the rapid growth of fresh leaves, they should be dressed with nitrate of soda, as previously advised. The presence of eelworms—creatures of microscopic size—is indicated by the premature withering of the foliage, the upper part of the root afterwards turning black, and decaying. The crop cannot be saved. It should be burned and the land should be limed, and no soil from it moved elsewhere. There is a fungoid disease known as beet-rot, which also causes the leaves to wither, but rarely before August. In this case, however, white patches edged with orange will be found on the stalks. If the roots are lifted before the fungus spreads from the stalks to them, they may be none the worse. For mildew, which can be recognised by grey patches on the lower side of the leaves, chiefly the inner and younger ones, spraying with a solution of liver of sulphur (½ oz. to 1 gal. of water) may be tried. Rust appears as white and yellow spots, which afterwards turn brown. The treatment should be the same as for mildew. In another fungoid disease the roots become covered with a thick felt of mycelium, which passes into the roots, bringing about the death of the plant. No cure is known. Here, as always, every part of the affected plants should be burned, and the land should be disinfected. This is the more important, as the fungus does not confine itself to beet, but attacks also potatoes, carrots, and other crops, and fungoid germs often remain in the soil for years.

BROCCOLI

(*Brassica oleracea botrytis asparagoides*)

The botanical name is rather overwhelming The two first words are applied to all members of the Cabbage family, the remaining two distinguish this variety from the others The broccoli is supposed to have been brought to Italy from Cyprus at the end of the sixteenth century From Italy, where it obtained its popular name, it gradually spread over Europe Between it and the cauliflower the difference is slight The broccoli is taller and thicker in the stem, and its heart is less delicate in flavour It is also hardier, and with precautions can be left out in the ground during the winter. If grown to come into season the same year, it may be regarded as an annual, and if not until the following spring, as a biennial

The inflorescence, the part which is eaten, contains 90 per cent of water, 2½ per cent of albuminoids, 5 per cent of starch and sugar, and nearly 1 per cent of various salts The salts have a medicinal value

Varieties —There are two different types, one with large, white hearts, the other producing a number of shoots, the tops of which are gathered before the flowers open To the latter class belong Christmas Purple Sprouting, Early Purple Sprouting, and White Sprouting, the last two later than the first Of the hearting class, Self Protecting Autumn and Walcheren come to maturity in the same year as sown, while Knight's Protecting and Snow's Winter are ready for cutting early in spring, and Veitch's Last White in May or June There are so many varieties on the market, most of them very much alike, that it is difficult to choose between them Chou de Burghley, a hybrid between the broccoli and the cabbage, has a small heart inside the leaves

Preparation of the Ground —Broccoli is a deep rooting plant of considerable bulk, and, like most members of the Cabbage family, it takes a great deal out of the ground, which should therefore be carefully prepared in autumn or winter—deeply dug or trenched, and well manured. In the Hadlow experiments the most effective and most economical winter dressing per acre was found to be twenty-five loads of stable manure, supplemented by 4 cwt. of superphosphate, potash not being necessary except on light land. If stable manure is unobtainable, the amount of superphosphate should be increased to 6 cwt., and potash should be added (1 cwt. of the sulphate or 4 cwt. of kainit).

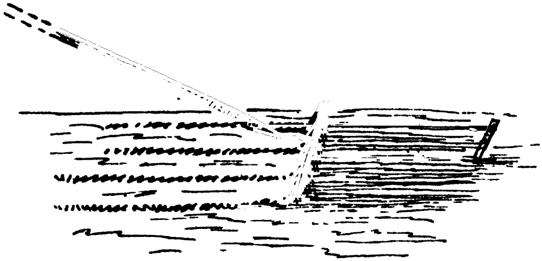

FIG. 11.—The Rake drawn along, not across, rows of seeds, the teeth just touching the soil.

Cultivation.—When several different varieties are grown for succession, the seed should be sown at different times, commencing in March or April, as soon as the weather and the ground are suitable. A small packet of each will suffice for an ordinary garden. Some of the penny packets are said to contain over 300 seeds, most of which should grow. The seed should be sown thinly in shallow drills about 10 in. apart in a special bed, the soil fine and smooth. Afterwards the drills should be filled, as usual, by pressing down into them the slight ridge on each side with the back of the rake. If the teeth are used for the purpose, any stones that happen to be lying on the surface are drawn forward first, and fall in among the seed. It is only for the subsequent levelling that the teeth should be used, and then they should scarcely touch the surface, and should be worked along the rows, not across them, otherwise they might drag out and scatter some of the seed. Either wire pea-guards should be placed over the rows, or black cotton should be stretched along them—about 3 in. above them. Unless this is done, sparrows, chaffinches, and other birds may destroy every seed. Sometimes the seedlings, thinned when necessary, are left in the bed until they can be planted out; but they grow stronger and more sturdy if they are first pricked out a few inches apart. When they are moved they should not be dragged up, as is often done. The soil should be loosened, so that they will come up without any breakage of the roots.

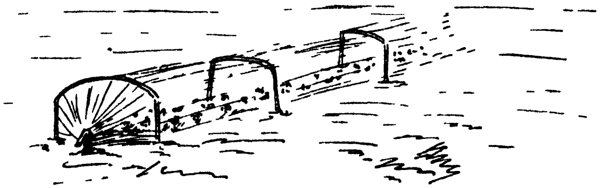

FIG. 12.—Home-made Seed Protector (wire arches connected by cotton).

Planting may commence in July. As the ground is generally dry then, a showery or dull day should be chosen in order to prevent flagging; or if the weather continues bright, the work should be done as late in the day as possible. If a plot has not been left vacant, some of the early potatoes will probably have been lifted, and as the haulm of these varieties is not very long, the spaces between the ridges of those that remain can also be utilised. The usual distances are from 18 in. to 2 ft. between the plants (according to the variety), and 2 ft. between the rows. Firm planting is essential, as it means firm growth, which reduces the risk of injury by frost. The holes should be made with the dibber. A plant should be placed in each so that it will be a trifle deeper than it was before. The soil should be stamped with the heel into close contact with it and, finally, should be soaked with water —pure water only. A fertiliser should never be given to plants which are not in active growth—which are therefore unable to use it. Two or three weeks later, however, about ½ lb. of nitrate of soda may with advantage be applied to every 10 sq. yds., and after the interval of a month, in the case of varieties maturing the same year, the application may be repeated. In the case of varieties that have to stand the winter, this second application is best withheld—at any rate until spring—because quick growth is soft and sappy. When hearts form, a leaf or two should be broken and bent down over them in order to protect them from frost, and also from rain, which is liable to blacken them. As soon as showery weather threatens, any fully grown hearts should be cut. They will keep fresh for a week or two in a cool larder.

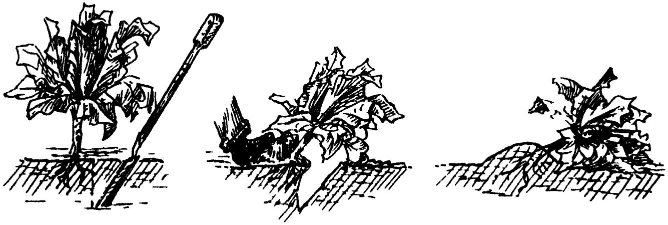

FIG. 13.—"Heeling down" Broccoli to protect it from frost.

In November all plants still in the ground should be "heeled over." This is done by taking a spadeful of soil from the north side of each, pressing down the head in that direction until the leaves nearly touch the ground, and finally laying the spadeful of soil over the stem on the south side. There are two reasons for this operation—to protect the stems by covering them with soil, and to protect the heads by shading them from sunshine. The latter reason may require some explanation. When a plant is frozen, the water in the cells passes out of them into the intervening spaces, the tissues consequently becoming flabby and discoloured. Unless the freezing is so severe as to cause an actual rupture or wound, if the subsequent thawing is gradual, the water returns to the cells and the plant recovers; but if the thawing is rapid, all chance of recovery is destroyed. Hence the "heeling over" towards the north, so that the direct rays of the sun cannot reach the heads.

When broccoli is cut, the stems should be pulled up at once. They are quite useless, and if they are allowed to remain they may continue for a time to draw a certain amount of food from the ground.

Pests and Diseases.—See Cabbage.

BRUSSELS SPROUTS

(*Brassica oleracea bullata gemmifera*)

This plant, like the broccoli, is a cultivated form of the common cabbage. Its head has been reduced in size, and much of the sap has consequently been diverted into the buds in the axils of the leaves, thus producing the sprouts. It has long been a popular vegetable in Belgium, and as it was supposed to grow there better than anywhere else, the seed used to be imported from that country. It is not easy to see how the idea originated. At the present day the Brussels Sprouts grown in England are remarkably fine, and the crop is a very profitable one. In the Hadlow experiments, with the same manuring as for broccoli, the amount of sprouts obtained was, on the average of five years, 318 sieves per acre, each sieve weighing 40 lbs. With artificial fertilisers alone it was very nearly the same.

Varieties.—Some varieties are rather larger than others, but that is about the only difference between them. The Wroxton and Aigburth appear in most seedsmen's catalogues.

The sprouts should be of medium size, round and firm, not loose and open.

Preparation of the Ground.—The ground should be prepared as recommended for broccoli.

Cultivation.—The method of cultivation should also be the same. But a first sowing is often made in boxes in a greenhouse or frame in February. Each box should have holes in the bottom to let any surplus water escape, and should contain a layer of broken crocks as drainage, then some of the coarser soil, and finally an inch or two of finely sifted soil, made firm and smooth. Two precautions are necessary—not to over-water the seedlings, and to give them fresh air as often and for as long as the weather will allow. In a stagnant atmosphere and in the presence of too much moisture they are liable to "damp off," the cause being a minute fungus in the soil. The disease can be prevented by sterilisation, the simplest method being to pour boiling water

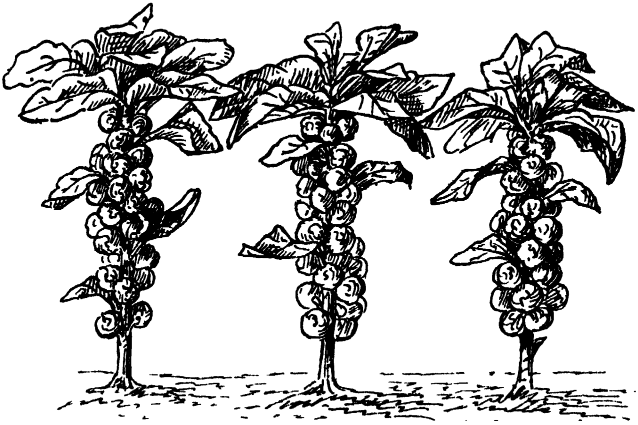

FIG. 14.—Brussels Sprouts, the tops covering and protecting the sprouts underneath.

over the soil, which should then be allowed to dry before the seed is sown in it. If the disease does break out, all the seedlings that are still healthy should be transferred at once to boxes of fresh soil. Early in April they will be large enough to be pricked out in a prepared bed, and in June they should be planted out. They will be ready for gathering at the end of October. Plants raised from seed sown outside in March will prolong the season throughout the winter. As the sprouts grow, the large side leaves may be pulled off to give them more space. But the tops protect the sprouts from frost and rain, and should always be left on until the last. They can be cut and used when all the sprouts are gathered.

CABBAGE

(*Brassica oleracea capitata*)

The wild cabbage is widely distributed. Like many other plants with succulent leaves, it grows near the sea—on the coasts of Britain, along the shores of the Mediterranean, and in many other places. In order to ascertain the cause of this character, a French botanist, M. Lesage (quoted by Professor Henslow), tried the effect of watering such plants as the common cress with a solution of salt, and succeeded in making them succulent. In subsequent generations the result was still more pronounced. Unlike the majority of plants, the cabbage has the stomata chiefly on the upper side of the leaves, but water is prevented from entering by a waxy excretion. The species is remarkable for the number of different forms which it has assumed under cultivation. Besides the ordinary cabbage, there are the broccoli, Brussels sprouts, cauliflower, colewort, kale, kohl rabi, savoy, and various others, including the tree cabbage, a gigantic variety, 10 ft. or more in height, largely grown for cattle food in the Channel Islands and in the north of France. Kale, cole (in colewort), caul (in cauliflower), kohl, the French *chou*, and the Italian *cavolo* are all derived from the Latin *caulis*, used by Cicero and Horace. The cultivation of the plant dates back to a very distant time. It is mentioned by Pliny and Cato under the name *Brassica*, and in India it has been grown for many centuries.

The cabbage contains 90 per cent. of water, rather more than 2 per cent. of albuminoids, nearly 5 per cent. of starch and sugar, and over 1 per cent. of salts, which are useful medicinally. All the different forms grown for their leaves have a very similar composition.

Varieties.—The red cabbage is used almost exclusively for pickling. The white or green varieties are very numerous, among the most popular being Drumhead and Enfield Market (large), and Ellam's Early, Nonpareil, and Rosette colewort (smaller, and better for private gardens). A large variety, called Couve Tronchuda, is grown for the mid-ribs of the leaves, which are cooked like seakale.

Preparation of the Ground.—See Broccoli.

Cultivation.—As 1 oz. of seeds contains 4,000 or more, it is rarely necessary to buy more than a small packet. Cabbages are most valuable in early spring, and after that in autumn or winter. In summer they are seldom wanted. It is almost impossible at that season to keep them free from caterpillars, and there are then so many other vegetables that are preferred to them. For the spring supply the seed should be sown in a prepared bed in August—if possible, in a position shaded during the middle of the day, in order that the soil may not be dried up quickly. The seedlings should be pricked out a few inches apart as soon as they are large enough, and in October they should be planted about 2 ft. apart. Towards the end of November, or early in December, some soil should be drawn round the stems with the hoe to protect them from frost. During hard weather a lookout should be kept for birds, especially partridges and larks, which sometimes peck the young plants to pieces. In March, when growth recommences, nitrate of soda at the rate of ½ lb. to 10 sq. yds. (or rather less of sulphate of ammonia) should be sprinkled over the ground. Waste salt is another useful dressing. "Bolting"—that is, running to seed—is not uncommon among spring cabbages. The cause may be that they were sown too early in the previous year; but more often it is some condition which interferes with their natural development—generally a deficiency of food or water.

For the autumn crop, the seed should be sown in April or May, and the plants put out during dull or showery weather in June, or as soon afterwards as space can be found for them. Being usually larger than the early varieties, they should be rather farther apart—about 6 in. farther.

Pests and Diseases.—Cabbages are often spoiled by the caterpillars of various butterflies and moths. Beyond searching for the pests and picking them off by hand, very little can be done. A poisonous liquid cannot safely be used for spraying and, even if it could be, it would not reach the insects which had bored their way into the hearts. Discoloured spots on the leaves may be due to the powdered wing fly, an insect closely related to the aphis. All such leaves should be destroyed. The small white maggots of the cabbage fly attack the stems

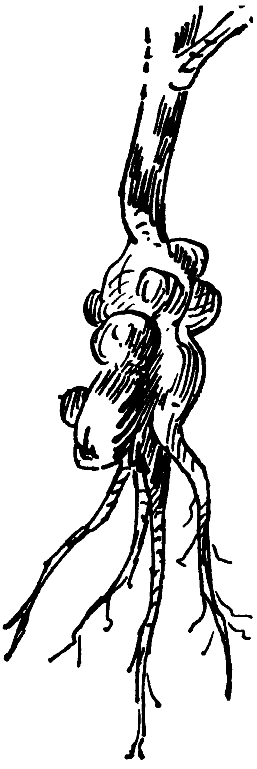

FIG. 15.—The "clubbed" root of a Cabbage.

and roots, the galls thus produced being often mistaken for those of club-root. The leaves flag and wither, and as the plants are rendered useless, they should be pulled up and burned. Club-root is, unfortunately, too well known to need description. It attacks the plants while they are young—according to Mr Massee, only while they are young—so if there is no sign of any excrescences on the roots when they are taken

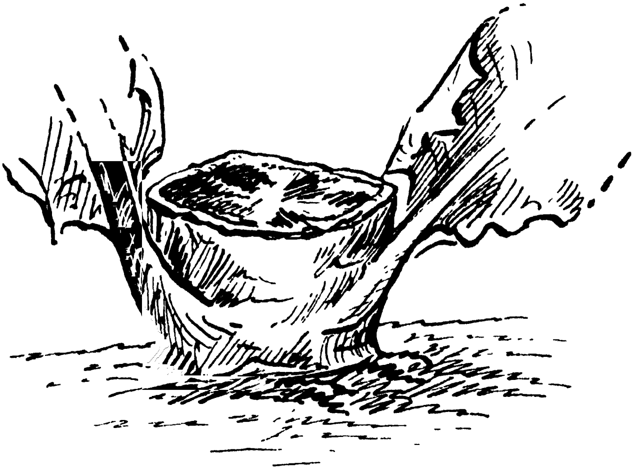

FIG. 16.—The stem of a Cabbage cut across to show black-rot.

from the seed-bed, they should afterwards remain healthy. Lime (at the rate of about 1 lb. to 1 sq. yd.) should be applied to any plot in which club-root has been noticed, and no members of the Cabbage family (including turnips) should be grown there again for several years. Cruciferous weeds, such as shepherd's-purse and charlock, are liable to perpetuate and spread the disease, and should not be allowed to grow. Every affected plant should be burned. The chief fungoid diseases, besides club-root, are—stem-rot, which causes large brown patches on the stems, the leaves withering and the plants eventually decaying; black-rot, which makes the veins in the leaves turn black; leaf-rot, which is a kind of mildew, whole patches appearing on the lower side of the leaves and extending rapidly; and leaf spot, a name applied to two different diseases, one with white spots, small at first, and the other with larger black spots. In most of these cases the plants must be burned to prevent the spread of infection. But black-rot and leaf-rot, if the attack is mild and in an early stage, can be checked by removing the diseased leaves, and spraying the plants with a solution of liver of sulphur (½ oz. to 1 gal. of water).

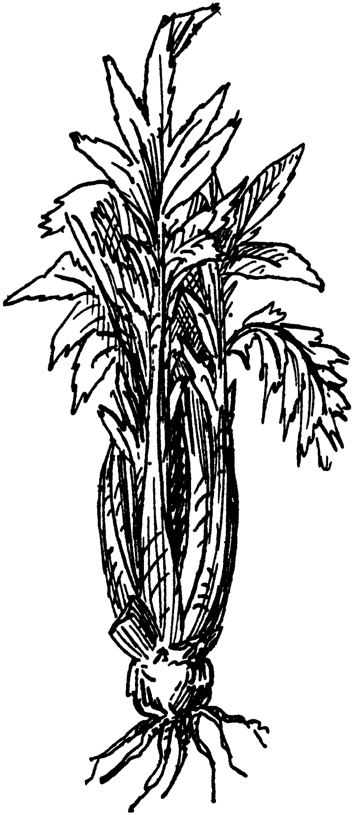

FIG. 17.—Cardoon.

CARDOON

(*Cynara cardunculus*)

The cardoon belongs to the same family as the Globe artichoke. It is thistle-like in appearance, and, being a native of the Mediterranean region, is not quite hardy. Though popular on the Continent, it is not grown in many English gardens. There are Spanish and French varieties, the former being generally preferred. The method of cultivation is much the same as for celery, rich deep soil being required. The seed may be sown either in pots or boxes under glass in March, and the seedlings transferred to trenches in May, or in shallow drills, 3 ft. apart, in the open ground in April, the young plants being afterwards thinned to the distance of 1 ft. Liquid manure should be given at frequent intervals, and water in dry weather. In September or October the plants should be earthed up. They are ready for use when they are blanched. If stored in the dark they will keep fresh for a considerable time. If they are to be left in the ground during frost, the ridges should be covered with straw. Cardoons are usually cut up into small pieces and stewed till tender, like celery.

CARROT

(*Daucus carota*)

The carrot has been grown for food from very ancient times. It is mentioned by Theophrastus, Dioscorides, Pliny, and other writers, though in many cases there is a doubt as to whether they were referring to it or to the parsnip. The wild plant is an annual, a native of Britain and other parts of Europe, and also of Asia. It has a comparatively thin and woody root and a pungent flavour. But that it was the origin of the garden carrot has been experimentally proved by sowing its seed in rich soil late in the season, saving and sowing seed from the best of the plants thus produced, and continuing this process for several generations. By this means the plants, unable to flower in their first year, were converted into biennials, and the food which they accumulated in the rich soil, and could not expend, was stored in their roots, which consequently assumed the fleshy character of those of the cultivated carrot. In another series of experiments carried out about the same time, it was shown that differences in soil produced differences in the shape of the roots, the stump rooted form being due to growth in shallow or very heavy soil, and the long-rooted to growth in deep, light soil, as in the case of beet.

The food value of the carrot depends mainly on its sugar (5 per cent.), for it has only ½ per cent. of albuminoids. It also contains 1 per cent. of various salts, and 89 per cent. of water.

Varieties.—Early French Forcing, a small variety with a very short, roundish root, is generally used for sowing in frames. Early Nantes, rather larger, is excellent for the first outdoor crop, and also for a late one. For the main crop, James' Intermediate, or one similar to it, should be chosen, unless the soil is shallow or heavy, in which case a stump-rooted variety, such as Long Horn, should be preferred.

Preparation of the Ground.—The ground should be deeply dug, especially for the long-rooted varieties, and left in rough ridges for the weather to pulverise it during the winter. The usual practice is to select a plot which was manured for the previous crop. If that is impossible, any stable manure applied should be laid at the bottom of a trench, not scattered about near the surface; for the roots necessarily extend along the lines of their supplies (in this case the emanations from the manure), and if the emanations proceed from different directions, forking is the inevitable result. When, however, the manure is at the bottom of a trench, the roots grow straight down towards it. If the amount applied either for the carrots or for the previous crop did not exceed twenty-five loads per acre (roughly, half a barrowload per 10 sq. yds.), it should be supplemented by potash (4 oz. of the sulphate or 1 lb. of kainit per 10 sq. yds.) and phosphate (1½ lbs. of superphosphate or 2 lbs. of basic slag), both of them applied when the ground is dug, or soon afterwards. In the Hadlow experiments it was found that in favourable seasons a large crop of good carrots could be grown with these artificials alone, provided that the usual spring dressing of nitrate was doubled.

Cultivation.—An ounce of seed is sufficient for a row 30 yds. in length. The first sowing may be made in a warm corner at the end of February or the beginning of March, if the weather is mild and the soil can be raked fine and smooth, and subsequent ones at intervals during spring and summer. The drills should not be more than 1 in. in depth—rather less if possible—and from 9 to 12 in. apart, according to the variety. If the seed is sown sparsely, little or no thinning should be necessary for the early crops; but the larger roots

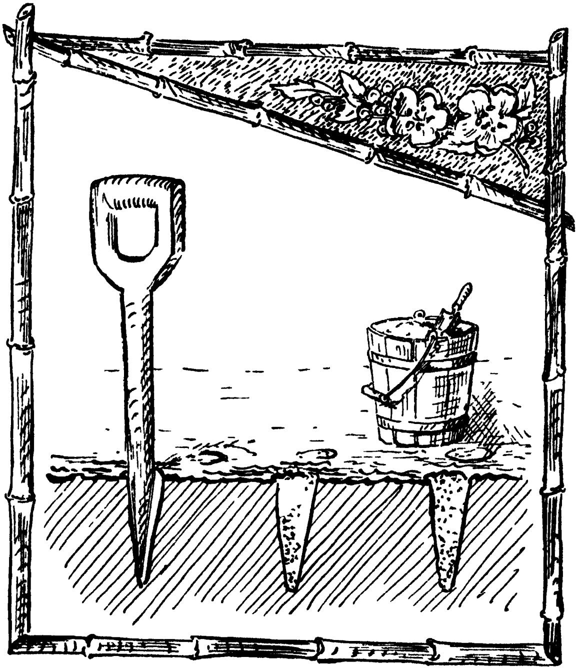

FIG. 18.—Holes made with the dibber for Carrots in heavy land, and filled with light soil.

intended for winter use should be thinned to 4 or 6 in. apart. A method sometimes adopted in heavy land is to make holes with the dibber about 6 in. apart in the rows, fill them with light, rich soil, and sow a few seeds in each, afterwards pulling out all but the strongest seedling in each case. In this way, in spite of the unfavourable conditions, very fine carrots can be grown. About a month or six weeks after the plants appear, a dressing of nitrate of soda should be applied at the rate of 4 oz. to 10 sq. yds., or rather less of sulphate of ammonia. A month later the dressing may be repeated. If no stable manure has been used on the ground for a couple of years, the amounts should be doubled. As soot contains from 1 to 5 per cent. of ammonia, it may be substituted for the nitrate at the rate of ¼ bushel to the square rod. But it should first be exposed to the air for a few days, for if quite fresh it will burn any foliage on which it happens to fall. Apart from its fertilising value, it is useful in keeping away insects. The ground between the rows of carrots should be frequently hoed during the summer, not only to keep down weeds, but also to let in air and to check the escape of moisture. But after both hoeing and thinning, the soil round the roots should be made firm again with the foot, to prevent the carrot fly from laying its eggs on them. As young carrots are much superior in flavour to old ones, they should be used as soon as they are large enough, and the supply maintained by successional sowings.

Forcing.—With a hot-bed carrots can easily be grown in winter or early spring. The ordinary practice is to sow radishes, and then, after covering the seed with fine soil, to sow the carrots, sprinkling the seed in both cases broadcast. The radishes come to maturity first, and when they have been pulled out, lettuces are sometimes planted among the remaining carrots if space can be found for them. The hot-bed is thus kept fully utilised. The carrots grown in this way are generally Early French Forcing. The first sowing may be made in

October, and others in November and the following months. The soil must not be allowed to get dry, and fresh air should be admitted on warm, sunny mornings. In severe weather more manure should be packed round the bed in order to keep up the heat, and at night the lights should be covered with matting.

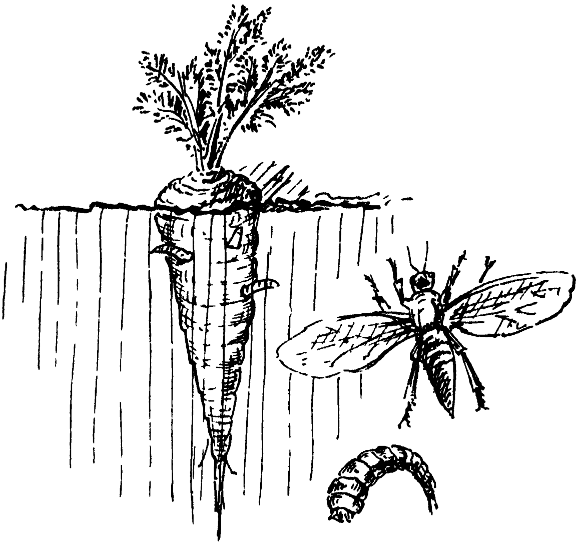

FIG. 19.—Carrot Fly and Larva (enlarged).

Pests and Diseases.—The carrot fly has already been mentioned. In some gardens it is very destructive. It is a small, dark-green fly with brown head and legs. It enters the ground to lay its eggs on or near the roots, into which the tiny maggots, when hatched, bore their way. Spraying the plants with weak paraffin emulsion has some effect in keeping the pests away, but obviously the best thing to do is, as previously advised, to keep the ground firm, so that they cannot penetrate it. There are also two moths whose larvæ damage carrots, and in their case also paraffin emulsion is useful. Wireworms (small tough-skinned, shiny-brown insects with three pairs of legs) and millipedes (easily distinguished from the larger, more active, insect-eating centipedes by their more numerous legs; mostly buff-coloured, and with the habit of curling up spirally when disturbed) destroy many roots, but chiefly in gardens which have not long been made out of old grass-land. They gradually disappear under good cultivation. Any roots containing them should be destroyed. Carrots are liable to be attacked by several fungoid diseases. One causes brown warts on the leaves and stalks, but does not

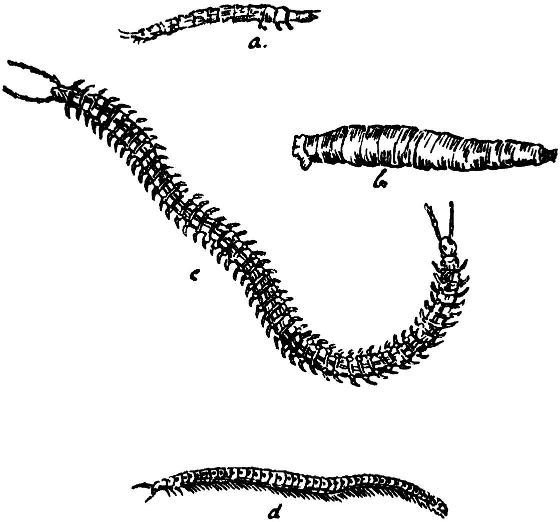

FIG. 20.—Three injurious insects (Wireworm *a*, Leather-Jacket *b*, and Millipede *d*) and a harmless one (Centipede *c*). The leather-jacket (legless, brown, and tough-skinned) is shown here because it is often confused with the others.

seem to do much harm; another, which covers the roots with a brown mycelium, is referred to under Beet; of a third, the most conspicuous symptom is a white mould at the ground level; and a fourth, the commonest, produces cankerous wounds on the roots. As plants attacked by any of these diseases cannot be cured, they should be pulled up and burned. They should never be mixed with healthy roots for storing.

CAULIFLOWER

(*Brassica oleracea botrytis cauliflora*)

The cauliflower is another vegetable which we owe to the ancient Greeks, though it may have been in existence even before their time. For some reason or other it did not become popular in this country until nearly the beginning of the eighteenth century, when it came into more favour and was grown in large quantities, not only for home consumption, but also for export to the Continent. A variety of the common cabbage, it is really a "monstrosity," the inflorescence having been converted by cultivation into a compact, white, fleshy mass called the heart. It differs from the broccoli only in being smaller, more tender, and more delicate in flavour. It has the same food value.

Varieties.—Early Erfurt, Early London, and Early Snowball appear in almost every seedsman's catalogue, and so for late use do Walcheren and Autumn Giant. They are all good standard varieties.

Preparation of the Ground.—See Broccoli.

Cultivation.—As it is usual to grow several varieties, a small packet of the seed of each will generally be sufficient. Even in ¼ oz. there are about 1,500 seeds. With good management it is not difficult to get cauliflowers from June to October. The first batches of the early varieties should be sown in boxes in the greenhouse in February and March, and the late varieties in a prepared bed outside at intervals during March and April. The seedlings should be pricked out a few inches apart, and when they are large enough should be planted out about 18 in. apart, with 2 ft. between the rows, in the open ground. During dry weather in summer they should be plentifully supplied with water, otherwise they are liable to "button"—that is, to form hearts too small to be of any use. A dressing of nitrate, as recommended for broccoli, will increase their size.

Not infrequently, too, the early varieties are sown outside about the end of August, the seedlings being transferred to a cold frame before sharp frost can injure them. During the winter, in order to prevent their being spoiled by damp, the lights should be opened as often as possible; but when the temperature is low, they should be covered with matting or sacking. In March or April, when the weather is fairly mild, the young cauliflowers should be planted out in a sheltered border; but if frost threatens, it may be necessary to protect them again by means of handlights, or in some other way. Late cauliflowers which have formed hearts should be cut at the approach of severe weather and kept in a cool place, where they will be safe from frost, until they are wanted for use.

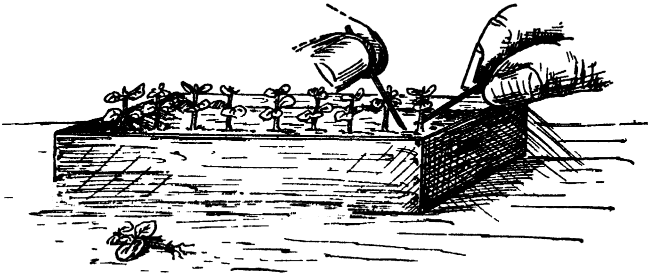

FIG. 21.—Pricking out Seedlings in a box.

Pests and Diseases.—See Broccoli.

CELERIAC

(*Apium graveolens rapaceum*)

Celeriac is a turnip-rooted variety of celery, the swollen root, which is the part eaten, having been produced by cultivation in the same way as that of the garden carrot. There are few references to it in the works of old writers. One of the earliest in which it is mentioned by its present name

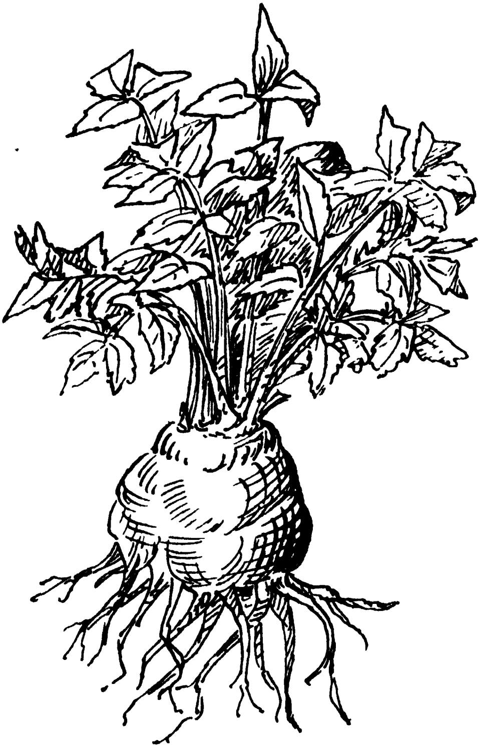

FIG. 22.—Celeriac.

occurs in a gardening dictionary published in 1758. Even now, though it is quite a good vegetable, it is by no means common in gardens. The fact that named varieties are not offered by seedsmen will show how little attention is paid to it—much less than it deserves. It is most frequently used merely for flavouring soups, but it can be boiled and served like turnip or, when cold, cut into slices and mixed in salads like beet.

The method of cultivation is the same as for celery, except that as celeriac does not require blanching, it is grown, not in trenches, but on the flat—the plants about 1 ft. apart, and the same distance between the rows. In autumn the roots are generally lifted and stored in a shed. If they are left in the ground until they are wanted, they should be protected by a covering of straw or leaves.

CELERY

(*Apium graveolens*)

Celery occurs wild in Britain and in most other European countries. It was formerly called Merche, probably from the fact that it grows in marshy positions, but more frequently smallage. It has a strong, unpleasant smell, and not only is exceedingly acrid, but also is supposed to be poisonous. It was therefore used only in small quantities as a medicine. Gerard, writing at the end of the sixteenth century, says: "This is not woonted to be eaten, neither is it considered good for sauce." The discovery that the objectionable principle could be eliminated by blanching does not appear to have been made until nearly a century later. Salmon, in his "English Physician," published in 1693, says: "It is either of the marsh, called by the common name smallage, or of the garden (made white and crisp by laying earth upon it), called sallary, as being used for a salet-herb." Salmon's definition, however, is erroneous. The name celery has nothing to do with salad; it is an Anglicised form of the Italian *seleri*, which again was a corruption of the Greek name for the plant, *selinon*.

The food value of celery is very small. It contains about 1 per cent. of albuminoids, 4 per cent. of starch and sugar, 1 per cent. of salts, and 93 per cent. of water. The idea that it has a beneficial influence on rheumatic ailments probably originated from the fact that it is able to flourish under excessively damp conditions, which conduce to such ailments in human beings; but it has a small quantity of an aromatic oil, which may have some medicinal effect.

Varieties.—Some varieties have white stalks, and others pink or red. Among the former, White Plume and Sandringham White are both good; and among the latter, Major Clarke's Red and Wright's Grove Pink. But as seedsmen are in the habit of giving their own names to the varieties which they offer, there are so many on the market that there is a wide choice.

Preparation of the Ground.—Celery is generally most satisfactory on fairly light land which has been deeply dug and heavily manured. In the Hadlow experiments the finest crops were grown with a hundred loads of stable manure per acre, or about a barrowload to 5 sq. yds.; but excellent results were obtained at much less cost by reducing the amount of manure by one half and supplementing it with phosphate (4 or 6 cwt. of superphosphate or 8 cwt. of basic slag) and potash (1 cwt. of the sulphate or 4 cwt. of kainit), a dressing of 2 cwt. of nitrate of soda being applied during growth. The actual saving effected by the latter method was between £7 and £8 an acre. There is a great advantage in digging the trenches in early spring, if not in winter, for the soil is improved by the long exposure to the air, and the ridges can be used for such quick growing crops as spinach and lettuce.

But before making the trenches, it is advisable to consider what object they are wanted to serve. This is twofold—to run rain down to the plants and facilitate watering, and to lessen the labour of earthing them up for the purpose of blanching. In neither case is anything gained by making the trenches a great depth, while if the whole of the rich top spit is removed, the plants will have to grow in the infertile subsoil. It is therefore a mistake to excavate, as is sometimes advised, to the depth of 1 ft. or more. A depth of 8 in. (or, at the most, 10 in.) is quite enough; in shallow land it should not be so much. The usual breadth is from 15 to 18 in., the distance between the trenches being about 3 ft. The stable manure should not be scattered about the ground, but should be laid at the bottom of each trench, and covered with a few inches of soil. The phosphate and potash, if used to supplement it, should be either mixed with it or distributed over the soil covering. The latter method is the more economical, because as the fertilisers dissolve they sink in the ground, so the higher they are at the start, the longer the time the plants have for absorbing them. This applies in a still greater degree to dressings of nitrate, which dissolves very quickly.

Cultivation.—Except for market gardening, there is rarely any need to buy the seeds by weight, for a small packet usually contains 2,000 or more. They are rather slow in germinating, and should be sown in boxes in the greenhouse or on a gentle hot-bed about the beginning of March, or, for a late supply, in a prepared bed outside in April. In either case the soil should be fine and smooth, and when the seedlings are large enough, they should be pricked out about 3 in. apart. Those in boxes should be grown close to the glass, with plenty of fresh air, in order to prevent their becoming tall and thin. At the end of May or the beginning of June, some should be strong enough for planting in the trenches. They are put out sometimes in a double row, the plants about 9 in. apart, and so arranged that those in one row are opposite the gaps in the other, and sometimes in a single row at the same distance. Naturally, they are able to grow to a greater size in a single row; but as a double row saves space and labour, it is more common in small gardens. A dull or showery day should be chosen for the work. The plants should be lifted with as little disturbance of the roots as possible, and, when in their new positions, should be soaked with water. If there is any likelihood of hot sunshine during the first few days, they should be shaded by means of branches laid across the trenches, or paper supported by sticks, in order to prevent flagging. Celery is sure to become tough and stringy if it is not kept growing continuously. Plenty of food and moisture are therefore essential. Three weeks or a month after planting, a dressing of nitrate of soda at the rate of 4 oz. to 10 sq. yds. (or rather less of sulphate of ammonia) will be beneficial. Weak liquid manure may also be given every few days when the soil is moist from rain or watering. When the outer leaves begin to spread, a little soil may be drawn round to hold them more erect. But earthing up should not be done until six or seven weeks before the celery is wanted for use. That is about the time required for blanching. If the soil is heaped up round the plants too early in the season, its pressure checks their growth, and is liable to make them push up flower stems; it also renders watering more difficult.

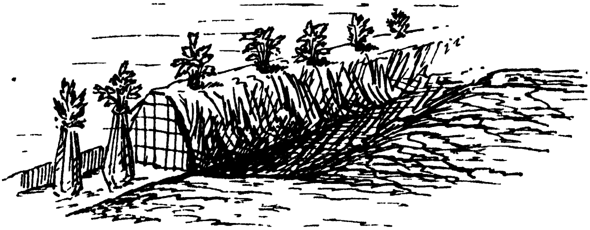

FIG. 23.—Earthing up Celery.

Earthing up is most easily done by two persons—one to take off any suckers and hold the leaves together, and the other to shovel the soil round the plants. When there is only one person, it saves trouble to commence by tying up every plant loosely with raffia. The ridges should be made steep, and beaten smooth with the back of the spade in order to run off heavy rain, for if it gets down into the hearts it may cause decay, and before severe frost comes they should be high enough to allow only the extremities of the leaves to be exposed. In some gardens, especially where celery is grown

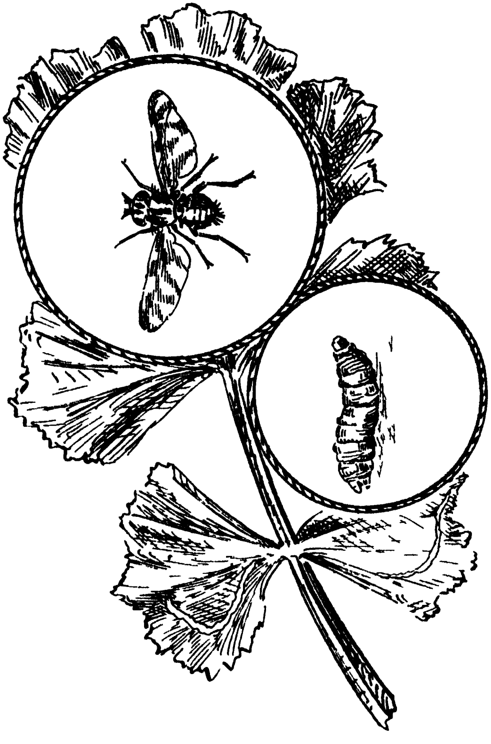

FIG. 24 —Celery Fly and Larva (enlarged).

for exhibition, it is blanched by tying brown paper round it. This certainly keeps the plants cleaner; but it is not sufficient to protect them in winter, and soil must then be ridged round them as usual. Celery is improved—made crisper—by slight frost, but, at the approach of hard weather, straw or leaves should be laid along the ridges.

Pests and Diseases.—The celery fly is often a serious pest. Like the chrysanthemum fly, it lays its eggs on the leaves, and the tiny maggots, which hatch in a short time, bore inside, making white blister-like marks, and destroying the tissues. All damaged parts of leaves should be taken off and burned. This should be done as soon as they are noticed—before the insects escape—otherwise the mischief will spread, for there are several generations in the course of a season. Spraying with weak paraffin emulsion has some effect in keeping the flies away from the plants. The fungoid diseases of celery are heart-rot (blackening and decay of the root), leaf-blight (round yellowish or grey blotches, the leaves ultimately withering and dying), leaf-scorch (brown or black spots, generally appearing late in the season, and spreading rapidly), leaf-rust (small wart-like brown spots), and leaf-spot (large brown or black spots, widely scattered). In all cases the affected parts, or, if the attack is a bad one, the whole plants should be burned. Spraying with weak Bordeaux mixture in the early stage of disease is sometimes recommended; but it would be safer to use a non-poisonous liquid, such as a solution of liver of sulphur (½ oz. to 1 gal. of water). When liver of sulphur is employed as a fungicide, it should always be fresh. It becomes powdery after it has been exposed to the air for some time, and it is then useless. As leaf-blight is most troublesome during strong sunshine, an endeavour should be made to shade plants which are threatened by it.

CHICORY

(*Cichorium intybus*)

Chicory, or wild endive as it is sometimes called, though a common weed in English cornfields, where its bright blue flowers are very attractive, is much more generally cultivated on the Continent than in this country. Besides the ordinary variety, there is a large one named Witloof, of Belgian origin. The seed can be sown at intervals throughout the season, commencing in April, the drills being 1 ft. apart, and the plants thinned to 8 or 9 in. The leaves, when about 9 in. in length, should be blanched by earthing them, or by tying bands of brown paper around them. Chicory can be used as a salad vegetable, or stewed like celery. The part which is mixed with coffee is the long carrot-like root after it has been kiln-dried and ground in a mill. If desired, chicory can be forced for winter use by treating the roots in the same way as those of seakale.

CHIVE

(*Allium schænoprasum*)

The chive is a native of Britain. Being of milder flavour than the onion, it is sometimes grown in gardens for the purpose of flavouring soups and salads. The small bulbs can be obtained from any seedsman. They are generally planted rather close together in early spring, and when they have made some young leaves, these are cut off for use. Others will soon grow, and many of these can be cut in their turn; but some growth must be allowed, otherwise the plants will be killed. All seed-pods should be taken off. Chives should be lifted every few years and planted in fresh ground.

CORN SALAD

(*Valerianella olitoria*)

This is a hardy annual, a native of Britain. It is grown in a few gardens, and makes a welcome change from the ordinary lettuce salad. There are two or three varieties, the one generally preferred being the Italian. The seed may be sown in drills, 8 or 9 in. apart, at any time from March to September. The plants should be thinned to about 6 in., and should be watered in dry weather. They should be used as soon as the leaves are large enough, otherwise, like spinach, they run to seed.

CRESS

(*Lepidium sativum*)

AND MUSTARD

(*Sinapis alba*)

As mustard and cress are almost invariably associated in use and require the same treatment, they are grouped together. Of the latter there are several varieties—the plain-leaved, the curled, and the Australian or Golden. The plant called American cress (*Barbarea præcox*) belongs to a different genus. It is a perennial, and bears some resemblance to water cress. Of mustard there is a brown-leaved variety as well as the white, but the latter is generally preferred. Cress is slower in germinating than mustard, and if both are to be ready at the same time, should be sown three days earlier. The seed can be sown throughout the year—in a greenhouse or even in a warm room in winter, and at other seasons in the open ground. It should be scattered thickly over the soil, and merely pressed in lightly. If it is covered, the young plants growing close together raise a solid crust above them and, when cut, cannot easily be freed from dirt by washing. Plenty of moisture is necessary all the time and, until germination commences, shade from sunlight. Indoors, strips of wet flannel are sometimes used instead of boxes of soil. Another method of growing mustard and cress is to sow the seed over potatoes or other vegetables in a hot-bed.

Watercress (*Nasturtium officinale*) can be grown in an ordinary garden if the soil is kept moist. The seed should be sown in shallow drills, about 1 ft. apart, in spring, and the plants thinned out to 6 in. The shoots emit roots from the joints, and, if desired, some of them can be taken off and planted separately to increase the stock. Watercress is a hardy perennial.

CUCUMBER

(*Cucumis sativus*)

The cucumber is a native of Southern Asia. It was cultivated in India many centuries before the Christian era, and from there passed to Egypt, Greece, and Italy. According to Pliny, the young fruits were enclosed in tubes, a device sometimes adopted at the present day in order to make them grow long and straight, especially for exhibition. The same writer tells us that the Emperor Tiberius had them grown in boxes on wheels, so that they could be moved into the warmest positions, and in cold weather pushed under frames with thin layers of crystallised selenite instead of glass. It is possible, however, that the cucumbers mentioned by Pliny were more of the Ridge type. The date of introduction into this country is given as 1573, and in the illustration in Gerard's "Herbal," published at the end of that century, the fruits bear little resemblance to those which we now grow in our greenhouses and frames. The English name is derived, through the French *concombre*, from the Latin *cucumis*, used by Virgil and probably connected with the Greek *siknos*.

The fruit contains 2 per cent. of sugar, but has no other nutritive value, its principal constituent being water (over 96 per cent.). It is very indigestible, especially when eaten without vinegar.

Varieties.—Of the many varieties on the market, Telegraph, Lockie's Perfection, and Tender and True are probably as good as any.

Preparation of the Soil.—The soil for cucumbers should be light and rich. If possible, it should be freshly prepared for every batch of plants. If cucumbers or tomatoes have been grown in it previously, it should be sterilised in order to destroy eelworms and germs of fungoid diseases. This can be done by baking it (saturating it with boiling water), or treating it with one of the disinfectants sold for the purpose. Three parts of turfy loam, broken up into pieces about the size of a walnut, and one part of decomposed manure with a little sharp sand, will make a suitable mixture. A sprinkling of phosphate and potash will improve it. The latter is also useful in preventing attacks of certain fungoid diseases, especially collar rot.

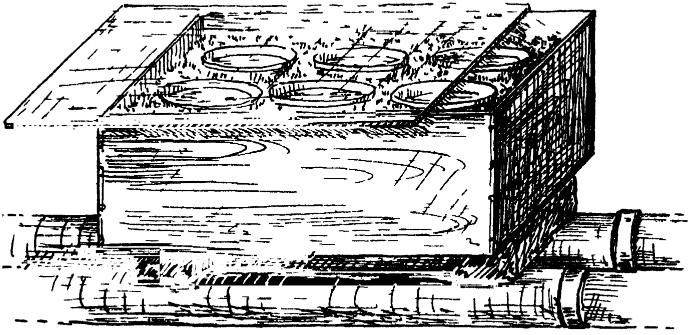

FIG. 25.—Home made Propagator placed on the hot-water pipes of a greenhouse

Cultivation in Greenhouses.—Cucumbers require a temperature which does not fall below 60° F. during the night and rises to 70° F. or more during the day. Where this condition is maintained, the seeds may be sown singly in small pots at intervals from the end of January to the beginning of April, to keep up a supply during the greater part of the year. In most cases, however, March is early enough, and plants raised then have a better chance than those raised in the previous months, when the outside temperature is lower. Unless there is a special bed, with bottom heat, in which the pots can be plunged, they should be packed in a box lined with damp moss, covered with glass, and supported on bricks laid on the pipes. After germination the glass should be raised to admit air, and when the seedlings begin to grow they should be brought nearer the light. The soil must not be allowed to get dry, and the water used should be tepid, not cold. The young plants will soon require larger pots, and eventually they should be moved into the largest size available, or, preferably, into boxes, unless there is a special bed for them. In order to prevent water collecting at the collar and possibly causing decay, each should be in the centre of a slight mound. In a pot or box, space should be left for the addition of fresh soil when the roots come through what they already have. The wires along which they are to be trained should be at least 1 ft. from the roof. If they are closer, some of the leaves are sure to come against the glass, and, as the result of the sun's rays acting on the moisture which accumulates at the points of contact, will be scorched. As

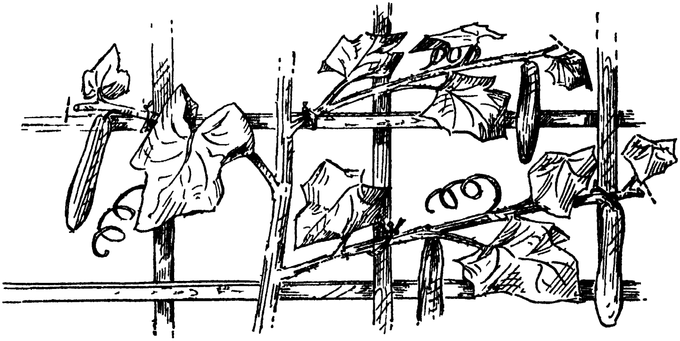

FIG. 26.—Cucumber, stopped at the first leaf beyond the fruit.

regards training, the leading shoots are sometimes allowed to extend as far as they will, the side shoots being tied out at right angles to them, and sometimes stopped after the first two or three pairs of leaves, the resulting shoots being carried upwards and treated in the same way as a single one. In spring fresh air should be admitted during bright sunshine, and in summer the lights can be left open a little during the greater part of the day. In hot weather it is necessary to shade the plants to prevent flagging; this is usually done by applying a thin wash to the glass. A moist atmosphere is essential. If it gets too dry, the foliage is almost sure to be infested with red spider. Weak liquid manure—most conveniently made by dissolving in water any of the fertilisers sold in tins—should be given every few days when the fruits begin to swell. They will mature sooner if the shoots bearing them are stopped at the first or second leaf beyond in each case. They should be cut while they are young and green, otherwise the plants will not long continue in bearing. Crowding of the shoots should be prevented by thinning.

Cultivation in Frames.—When cucumbers are to be grown in a frame, a hot-bed is necessary. If a start is made early in the year, the bed should be quite 4 ft. deep and 2 ft. longer and broader than the frame. The manure should be fresh, so that all its heat may be utilised, and it should be shaken free from lumps and arranged in layers, each of which in turn should be well trodden down in order to make a consistent mass and prevent unequal heating. A few inches of soil should then be laid on top, and the frame put on. The seeds should be sown in pots exactly as in a greenhouse, and when the seedlings are large enough, they should be planted on slight mounds. Two under each light, at opposite corners, will be sufficient. During the night, in the earlier part of the year, the lights should be covered with matting, and if the temperature falls below 65° F., fresh manure should be added round the outside. On sunny days the lights should be opened for an hour or two. As there are no wires for training purposes, the plants are stopped several times and so made to spread out, one result being that they generally require a good deal of thinning. Lying on the soil, the fruits are not so evenly coloured or so straight as when they hang from wires; but an improvement can be effected by changing their positions occasionally or putting slates underneath them. From plants raised on a hot-bed in February, fruits can be obtained early in May.

Cultivation in the Open Air.—See next section—Ridge Cucumbers.

Pests and Diseases.—The commonest insect pests are aphides, thrips, red spider, and eelworms. Aphides and thrips can be got rid of by vaporisation, or by spraying several times (at intervals of a few days) with soapy water, to which a little nicotine or quassia decoction has been added. Spraying—persistent and forcible spraying underneath the leaves—is also effectual against red spider, a small reddish-brown insect which makes the foliage a sickly, mottled colour. Eelworms are much more difficult to manage. They are too small to be seen with the naked eye, but if a plant fails without any perceptible cause, their presence should be suspected; and if little excrescences or knots are found on the roots, any doubt will become a certainty. As they are inside the tissues, no cure is possible, and all affected plants should be burned in the hope of saving the others. The soil should be sterilised.

Fungoid diseases, unfortunately, are rather numerous. Two attack the plants at the ground level, one of them (previously referred to under Beans and Cabbages) causing a white mould on the stem, and the other—known as collar-rot—a white film, the leaves in both cases turning yellow, and the plants ultimately collapsing. For the former, spraying with Bordeaux mixture has been recommended; and for the latter, watering with a solution of sulphate of potash. Kainit mixed with the soil before planting is said to be a preventive.

Canker, a more deadly disease, can be recognised by the darkening of and the gummy exudation from the joints, the leaves flagging first, and afterwards the shoots. The plants should be burned. For mildew (whitish or pale lilac patches underneath the leaves), spraying with either weak Bordeaux mixture or a solution of liver of sulphur is generally sufficient. In leaf-blotch, a very destructive and infectious disease, which is incurable, the spots are at first small and pale green in colour; but they very rapidly increase in size, and turn brown. It is most prevalent where there is a deficiency of fresh air. Two diseases - cucumber rot and fruit rot—attack leaves, stems, and fruits, the former distinguished by black patches which eat into the tissues, and the latter by the decay of the parts affected, especially the tips of the young fruits. The plants should be sprayed every few days with a solution of liver of sulphur (about $\frac{1}{4}$ oz. to 1 gal. of water). For scab, which causes black, roughened patches on the fruits, the same spray should be used. There is also a bacterial disease called blackleg, which is sometimes troublesome, the leaves withering from the base upwards, and the stem turning black. In this case, also, the plants should be burned. For knot-root disease, see Tomato.

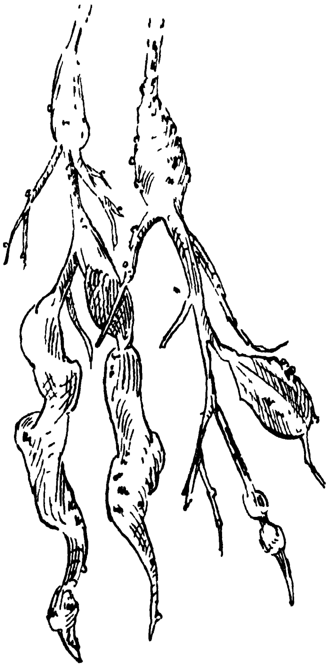

FIG. 27.—Cucumber knot-root disease.

CUCUMBER, RIDGE

The Ridge cucumber differs from the greenhouse or frame kind not only in being hardier, but also in having shorter, thicker, and generally rougher fruits. As the result of being grown at a lower temperature, they are slower in maturing, and consequently are more bitter in flavour, and not so crisp. The crop is an uncertain one, depending almost entirely on the weather. In a warm summer it may be quite good.

Varieties.—Bedfordshire Pride and Stockwell Long are both popular. For pickling, the Gherkin, a small variety, is usually grown.

Preparation of the Soil.—In a warm position, sheltered from north and east winds, the soil, mixed with decomposed manure, should be thrown up in a ridge, or mounds should be made about 3 ft. apart.

Cultivation.—Seeds may be sown in April in the greenhouse, or at the end of May in the position which the plants are to occupy. In the latter case, three or four should be sown a few inches apart in a group, with 3 ft. between the different groups. They will germinate better if they are covered with handlights. In the former case, the young plants should be put out at the same distances as the seeds, and at about the same time. Boxes should be inverted over them at night if the temperature is low. The general treatment should be the same as for plants in frames.

Pests and Diseases.—See previous section—Cucumber.

ENDIVE

(*Cichorium endivia*)

Endive is a native of Western Asia. It is naturalised in the Levant, and has long been cultivated in Egypt. Among the early writers who mention it and its relative chicory (*C. intybus*) are Pliny, Ovid, and Virgil. It was introduced into this country at the beginning of the sixteenth century, but possibly because the bitter principle in it is not entirely removed by blanching, it has never become very popular. On the Continent it is much more largely used. The name is borrowed from the French, and is a Gallicised form of the Italian *endivia*, derived from the Latin *intubus*, or *intybus*. The Arabic *hindeb* is obviously another and possibly older form of the same word.

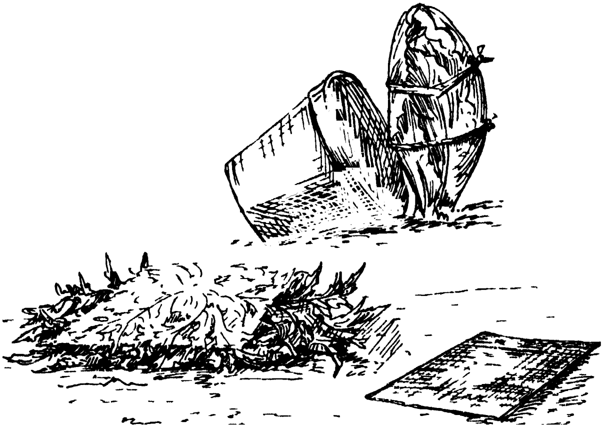

FIG. 28.—Endive—broad-leaved (above), tied up like a cos lettuce, and moss-curled (below), blanched by means of a slate.

Like many other salad vegetables, endive has scarcely any food value. It contains about 1 per cent. of albuminoids and 3 per cent. of starch and sugar, the rest being mainly water.

Varieties.—There are two distinct kinds—one with the leaves narrow and curled, such as Moss Curled, and the other with the leaves broad and uncurled, such as White Batavian.

Preparation of the Ground.—As endive is almost invariably grown in this country for winter use, the preparation made for the previous crop is generally sufficient, though a little digging and levelling may be necessary.

Cultivation.—A small packet of seed will provide enough plants for most gardens. As they are liable to "bolt" if raised early in the season, it should not be sown before the middle of July, the best plan being to sow half then, and the other half in August. It is sown sometimes in a special bed, the plants, when large enough to move, being transferred to their permanent positions, and sometimes in the open ground. The usual distance between the plants is 1 ft., and between the rows 15 or 18 in. Plenty of moisture is necessary in summer, but as damp is injurious in winter, the ground should be well drained. Weak liquid manure may be given every few days. Blanching takes a fortnight, or rather less; and about that time before the plants are wanted for use, the broad-leaved varieties should be tied up like Cos lettuces, or covered with large flower pots (with the holes in the bottom stopped), and slates or boards should be laid flat over the curled varieties. At the end of October, in order to prevent their being damaged by frost, a number of the largest plants should be lifted with soil and planted rather close together in a cold frame, or else placed in a shed. They can be blanched easily by covering them so as to exclude the light.

Pests and Diseases.—Endive is remarkably free from pests of all kinds.

HERBS

In the vegetable garden the word herb is applied loosely to an aromatic plant, sometimes an annual, but more generally a perennial, which is used for flavouring. At one time a large number of such plants were grown, the herb garden being a common feature of the grounds of a country house; but the majority were so seldom wanted that they have almost entirely dropped out of cultivation. Of those that remain, the most important are mint, sage, and thyme. These, with a few others, are dealt with briefly below.

Balm (*Melissa officinalis*).—A perennial, propagated by seed or by division in spring.

Borage (*Borago officinalis*).—An annual easily raised from seed sown in March or April. The green leaves are chiefly used for flavouring claret cup.

Marjoram (*Origanum*).—Two species are cultivated—Pot Marjoram (*O. onites*) and Sweet Marjoram (*O. majorana*). Both are perennials. The former is usually propagated by division or by cuttings, the plants grown about 1 ft. apart. As Sweet Marjoram is killed in our climate in winter, it is raised afresh every year by seed sown in spring. The tops of both species should be cut off just as they come into flower and, after having been dried, should be kept for flavouring.

Mint (*Mentha*).—Three species are cultivated—Pennyroyal (*M. pulegium*), Peppermint (*M. piperita*), and Spearmint (*M. viridis*), but the last is the only one wanted in the kitchen. It is a hardy perennial, spreading rapidly by means of underground stems, which can be divided in spring to increase the stock, or planted in boxes of soil in the greenhouse in winter to obtain early supplies. When flowers appear, the tops should be cut off and dried. They can be kept thus for winter, or the leaves can be crumbled and put in wide-necked bottles. Mint is subject to an incurable disease called rust, from the appearance of the leaves and stems. All the affected plants with their underground stems should be burned, and a fresh plantation of healthy mint should be made elsewhere.

Rosemary (*Rosmarinus officinalis*).—A hardy evergreen shrub, which can be propagated by seed sown in spring, or by cuttings of partly ripened wood taken towards the end of summer. The soil for Rosemary should be dry, and the position sunny.

Sage (*Salvia officinalis*).—Requires the same treatment as Rosemary. As it also is evergreen, there is no need to dry and store the leaves like those of Mint.

Savory (*Satureia*).—There are two species—Summer Savory (*S. hortensis*) and Winter Savory (*S. montana*). The former is an annual, which can be grown from seed sown in April, the plants being thinned to about 6 in. apart. Winter Savory is an evergreen perennial, and can also be propagated by seed, but more quickly by division or cuttings.

Tarragon (*Artemisia dracunculus*).—A perennial, not quite hardy, and best kept in a frame in winter. It is propagated by division in spring, or by cuttings towards the end of summer. The leaves, either green or dried, are used for flavouring salads and vinegar.

Thyme (*Thymus*).—There are two kinds cultivated in gardens—ordinary Thyme (*T. vulgaris*), and Lemon Thyme (*T. citriodorus*), a variety of the common wild Thyme, which is a native of Britain. They are both perennials, but they deteriorate in a few years, and should then be renewed. They can be propagated by seed, layer, or cuttings. The leaves should be gathered when the plants are about to flower, and dried and stored like those of Mint. As in the case of most herbs, Thyme grows best in a light soil and a sunny position.

HORSE-RADISH

(*Cochlearia armoracea*)

Horse-radish, though it grows wild in some districts, is not a native of this country. Lord Avebury expresses the opinion that it has been derived from a Hungarian species, *C. macrocarpa*. It has been cultivated from remote times. In many gardens it receives little attention, being left year after year in some neglected corner, yet it amply repays any trouble taken with it. It can be grown from seed, but in order to save time, straight pieces of the root are generally used. If they are already provided with crowns, all except the centre one in each case are cut off. The ground should be deeply dug, and manure should be placed at the bottom of a trench, not scattered about the soil, which would induce forking. In early spring the pieces of root should be planted in holes made about 1 ft. apart with the dibber. When they are thick enough for use they can be dug up as required. For winter, when the ground may be frozen hard, some roots should be lifted and either laid in soil and covered with litter, or else

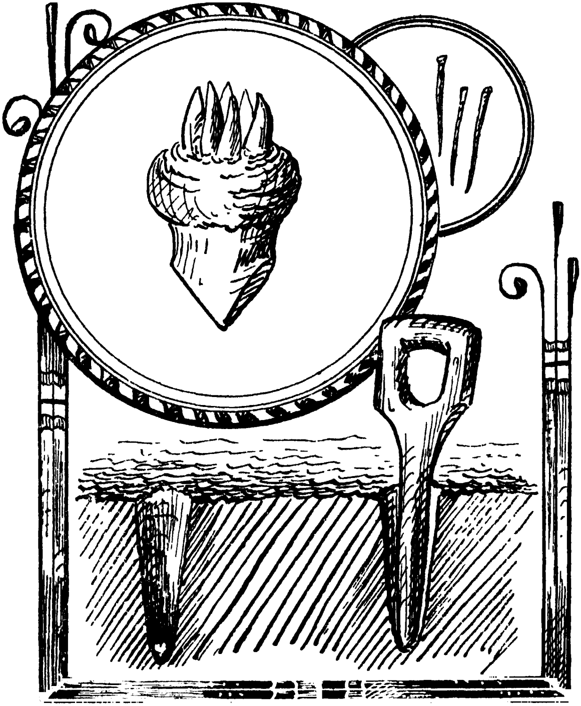

FIG. 29.—Planting Horse-Radish. Above, an old crown (left), and three small root-thongs (right).

stored in moist sand in a shed. A fresh plantation should be made every three years.

KALE OR BORECOLE

(*Brassica oleracea acephala*)

Kale was once synonymous with cabbage, but is now confined to a tall, loose-growing kind with curled or fringed leaves, which has been modified in various ways by cultivation and hybridisation. The prefix *bore* sometimes occurs alone in old writers, for instance Tusser. It is connected with an Anglo-Saxon word *borel*, a kind of rough cloth, the word being used by Chaucer and others to signify coarse, common, or vulgar. From it we get "burly."

Varieties.—Asparagus kale, Cottager's, Dwarf Curled, and Ragged Jack are among the many varieties. There are also several with variegated foliage, which are not infrequently grown for decorative purposes.

Preparation of the Ground. — See Cabbage. Of course, where kale is grown between rows of potatoes or in similar positions, the ground cannot be specially prepared for it.

Cultivation.—A small packet of seed is quite sufficient, unless great quantities of kale are required. It should be sown in a seed-bed in April, care being taken to protect it from birds; and when the seedlings are large enough to move, they should be pricked out a few inches apart. They are usually put out—about 2 ft. apart—when a plot has been cleared of its early crops, or, if there is sufficient space between rows of potatoes, they may be planted there. In the former case some manure should be dug in before planting, and, in the latter, a dressing of phosphate and potash should be applied. After they have made a fresh start, nitrate of soda at the rate of 4 oz. to 10 sq. yds. will assist their growth. After the tops have been cut for use, the stems will continue to supply sprouts for some time; but in April they should all be pulled up and burned.

Pests and Diseases.—See Cabbage.

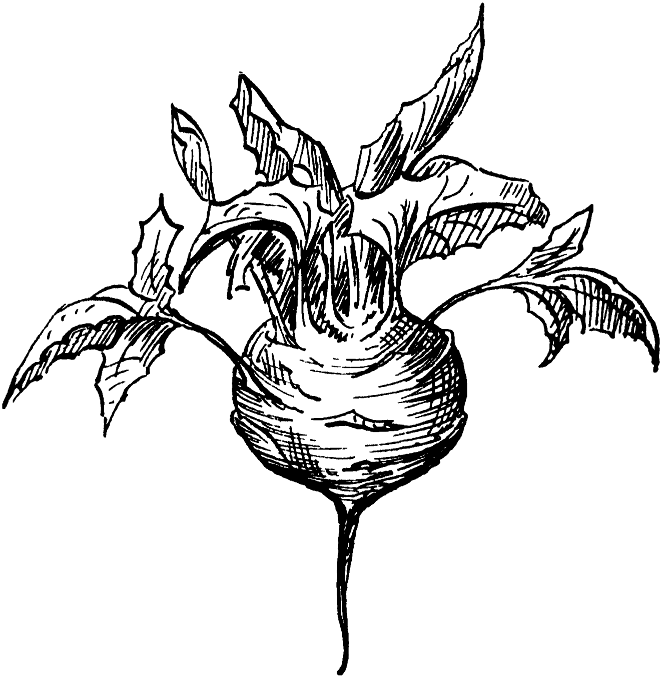

FIG. 30.—Kohl Rabi.

KOHL RABI

(*Brassica oleracea caulo-rapa*)

Kohl rabi is a cultivated form of the common kale or cabbage, bearing some resemblance to the turnip (*Brassica rapa*)—hence the name. It is quite hardy. Though formerly grown only for cattle, it is an excellent vegetable, and its cultivation in gardens is extending. The roots should be of medium size. If they are allowed to get very large, they become coarse. Their season is from August onwards.

Varieties.—Dwarf varieties should be chosen for the garden. Two of the best are Early Purple and Early White.

Preparation of the Ground.—The ground should be deeply dug, and manured in autumn or winter, as for Cabbage.

Cultivation.—An ounce of seed should provide enough plants for a row 300 or 400 yds. in length. It should be sown in April or May, in shallow drills 18 in. apart, the plants being afterwards thinned out to about 1 ft. If there are gaps, they can be filled by means of the thinnings. If preferred, the plants can be raised in a seed-bed like other kinds of cabbage, and put out when they are large enough. The hoe should be used frequently among the rows, and weak liquid manure given at intervals. The roots are ready when they are the size of a small turnip. There is no need to lift and store them when cold weather comes, but when the ground is frozen hard it may be difficult to get them up unless they have been protected with litter.

Pests and Diseases.—Kohl rabi is rarely attacked by any of the insects or diseases which often spoil the turnip crop. This immunity ought to make it more popular.

LEEK

(*Allum porrum*)

The leek is supposed to have been derived from a bulbous species, *Allium ampeloprasum*, a native of the countries bordering on the Mediterranean. Earthed up and compelled to elongate, it has almost entirely lost its bulbous character. It was cultivated in very remote times by the Egyptians, and afterwards by the Greeks and Romans. Pliny tells us that it was a favourite vegetable of the Emperor Nero. The leaves seem to have been used largely, though not exclusively, for the seed was sown thickly, as is often done at the present day, in order to make the crowded plants grow up long and straight. A good deal of trouble was taken, a common practice being to sow in a seed-bed and to plant out afterwards. The name used by Horace and others was *porrum*, though this may sometimes have referred to the chive. There is no record as to when the leek was introduced into Britain. In early days it does not seem to have been much thought of, for old writers often used the word as equivalent to something of no value. In the Harleian MSS. the couplet occurs: "The beste song that ever was made, ys not worthe a leky's blade." The Egyptians, on the other hand, regarded the leek with extreme veneration. Juvenal says: "While towns worship the dog, but not Diana, it is wicked to injure the leek and the onion." So the Welsh have some precedent for taking the leek as their national emblem. The name is a form of the Anglo-Saxon *leac*. It occurs also in garlic (*gar* meaning a lance or dart, or in a more general sense equipment, as in the modern gear).

The food value of all the *Allium* family is very much the same as that of its most important member, the onion.

Varieties.—The Lyon, Musselburgh, and London Flag are three standard varieties which are sold by all seedsmen.

Preparation of the Ground.—Leeks require deep soil which has been heavily manured. In the Hadlow experiments the best and most economical results were obtained from twenty five loads of stable manure per acre, supplemented by phosphate and potash; or for 10 sq. yds., half a barrowload of stable manure, 1½ lbs. of superphosphate (or 2 lbs. of basic slag) and 4 oz. of sulphate of potash (or 1 lb. of kainit), a light dressing of nitrate being applied during growth. Unless the plants are to be grown on the flat, trenches should be made as for celery. They should be at least 4 ft. apart, to allow of intercropping.

Cultivation.—From 1 oz. of seed 1,000 plants or more should be obtained, enough for a row over 150 yds. long. If they are wanted very large, it should be sown in boxes of light, rich soil in a greenhouse or on a hot-bed at the end of January or the beginning of February. For exhibition, in order to avoid disturbing the roots, it is not unusual to sow in small pots, three or four seeds in each, the seedlings being reduced to one, the strongest. Early in April the young plants should be hardened off in a cold frame

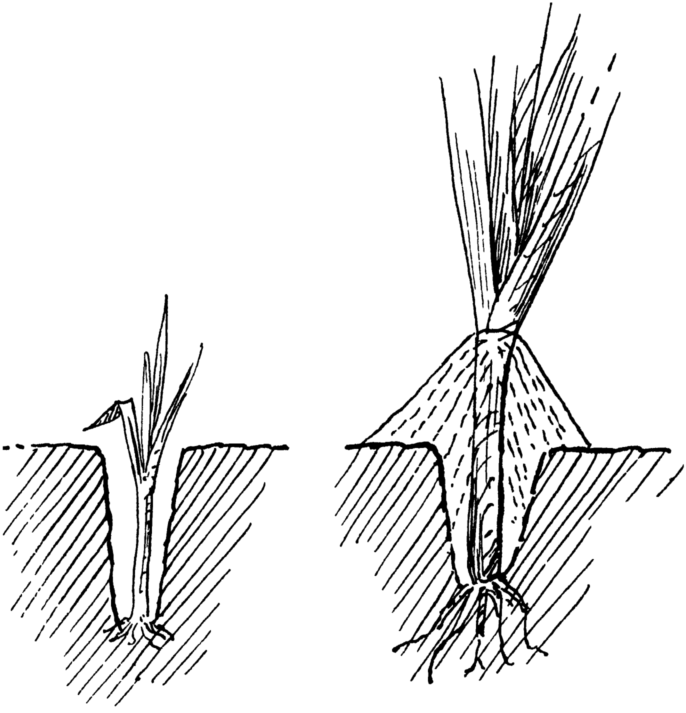

FIG. 31.—Leeks, just planted (left), and after growth earthed up (right).

with plenty of fresh air, and at the end of the month they should be planted out from 9 to 12 in. apart. When they are grown on the flat, there should be about the same distance between the rows as between trenches. Plants from pots should be put in with the trowel; those from boxes should be dropped into holes 5 or 6 in. deep, made with the dibber, and, after planting, filled with water. There is no need to push soil into them. The water will carry down enough, and the holes not only will support the plants, but also will blanch the lower part of each, thus saving trouble afterwards.

In some gardens blanching is done by tying loosely brown paper collars 6 in. high round the plants as soon as they are in position, and gradually increasing the height of the collars as growth proceeds. This method has the advantage of keeping the soil out of the folds of the leaves, and so of preventing the grittiness which is not uncommon when leeks are cooked, even after careful washing. But even with collars it is best to earth up in the usual way, adding a little to the ridges every fortnight or three weeks. Plenty of water should be given in dry weather, and liquid manure at intervals. Heavy dressings of nitrate do not seem to yield an adequate return, but a sprinkling of nitrate of soda (about 4 oz. to 10 sq. yds.) may be beneficial.

Very good leeks, though not of the largest size, can be obtained by sowing in shallow drills in fine rich soil as soon as the weather permits in March. They should be thinned out to 4 or 5 in. apart, and kept well provided with food and water. If desired, the thinnings can be planted elsewhere.

The earliest leeks should be ready in September, and the supply should continue throughout the winter. They are quite hardy, and do not need storing; but, as in the case of celery, litter strewn along the ridges will render lifting easier when the ground is frozen hard.

Pests and Diseases.—Several of the pests and diseases which attack the onion also attack the leek, especially the onion fly and onion mildew. For particulars and treatment, see Onion.

LETTUCE

(*Lactuca sativa*)

Lactuca sativa, a species which grows wild in some of the eastern and southern countries as well as in many places on the Continent and in Asia, is considered to be the origin of the cultivated lettuce. Lord Avebury, in his "British Flowering Plants," says of it: "This is a shade-loving species, and the leaves are very delicate. While most English plants have the leaves so arranged as to receive a maximum of light, in this species they change their positions so as to avoid it. In the morning and evening, when it is faint, they are ranged perpendicularly to it, *i.e.*, east and west. When, however, the sun becomes strong, they turn themselves north and south, so as to receive as little light as possible." This "shade-loving" character is retained by the cultivated form, for if grown in strong sunshine in summer it quickly runs to seed, especially if there is any deficiency of moisture. There are many references to *Lactuca* in the works of old writers. Pliny mentions several varieties, one of them Crisped, probably similar to our cabbage class, and so does Theophrastus. The English name is, of course, derived from the Latin, which it owes to its milky juice. Suetonius applies the diminutive *Lactucula* to the young plants. In this country the lettuce has been cultivated for nearly four centuries, and possibly a good deal longer.

The lettuce contains about ½ per cent. of albuminoids, 2 per cent. of starch and sugar, 1 per cent. of salts, and over 94 per cent. of water. One of its constituents is a mild opiate called lactucarium, which, though present in very small quantities, may be useful in inducing sleep.

Varieties.—There are two classes—the Cabbage, with spreading leaves and forming a heart, and the Cos (which may have originally come from the island of that name), taller and more upright. In the former, All the Year Round (good for winter as well as summer), Paris Market, and Tom Thumb (small, and occupying little space) are old favourites; and in the latter, Paris White, Paris Green (rather hardier), and Bath Black-seeded (the hardiest of all).

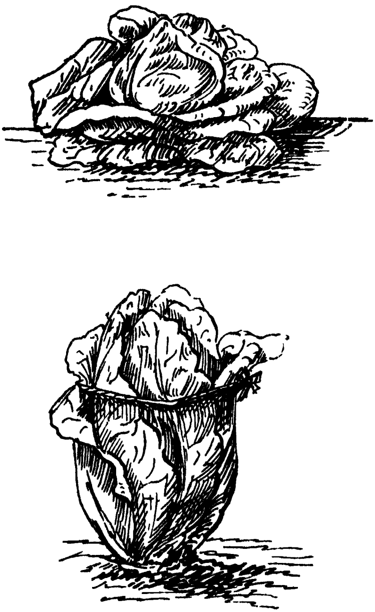

FIG. 32.—Cabbage Lettuce (above) and Cos Lettuce (below).

Preparation of the Ground.—The essential condition for good, crisp lettuces is quick and continuous growth, which requires plenty of moisture and food, and a suitable temperature. Hence the importance of stable manure, for it not only introduces moisture into the ground, but also helps to retain it there. In the Hadlow experiments it was found that, except in a wet summer, a satisfactory crop could not be grown with artificials alone, and that a heavy dressing of stable manure (about a barrowload to 10 sq. yds.) produced better results than a light one. It should be dug in in autumn or winter. If only half that dressing can be given, it should be supplemented by superphosphate (1½ lbs. to 10 sq. yds.) or basic slag (2 lbs.). Potash seems to be unnecessary: "On the whole it produced no substantial effect." But during growth a heavier dressing of nitrate than usual should be given (1 lb. of nitrate of soda to 10 sq. yds. applied in two instalments, or rather less of sulphate of ammonia). For autumn or winter lettuces the conditions are rather different, for they are not likely to be short of moisture, and they are grown on ground which has been prepared for another and, as a rule, deeper rooting crop. It is rarely necessary to dig in more stable manure, but phosphate and nitrate should be used in the same proportion as for summer lettuces.

Cultivation.—An ounce of seed should be sufficient for a row 100 yds. or more in length. For the earliest crop a little should be sown very thinly in a box of light, rich soil in a warm greenhouse or on a hot-bed about the beginning of February, and the seedlings pricked out in other boxes, grown close to the glass to keep them dwarf and with plenty of fresh air to prevent injury by damp, and in April planted out about 1 ft. apart in a sheltered position. A second sowing may be made in a cold frame in March, the seedlings being transferred to the open ground when they are large enough. Outdoor sowings may commence at the end of March or the beginning of April, and should continue at intervals of a few weeks throughout the season. Only in this way can an uninterrupted supply be maintained, for in summer the plants very quickly run to seed. For this reason they should be grown where they will be shaded from the midday sun—for instance, between rows of tall peas.

For winter lettuces, on the other hand, the position should be warm and sunny, yet not so shut in as to be damp.

The seed should be sown in shallow drills in soil which has been raked fine and smooth, and should be protected from birds. As the seedlings grow they should be thinned from 6 to 9 in. apart. Thinning should always be done when the ground is moist, otherwise there is a risk of disturbing the remaining plants. It is rarely worth while to transplant in summer. It can be done with the aid of the trowel and plenty of water, but it generally results in running to seed. In dry weather watering is necessary, but the labour can be reduced by frequent hoeing, for the loose surface layer thus produced checks the escape of moisture from the ground. Cabbage lettuces heart naturally, but the Cos should be tied up loosely near the top with raffia. In autumn, before severe frost comes, the best plants should be lifted with soil attached to their roots, and planted close together in a cold frame. They should be shaded for the first week, and afterwards fresh air should be admitted at every opportunity. If water should be required, it should be poured on the soil, not over the foliage. On cold nights the lights should be covered with mats.

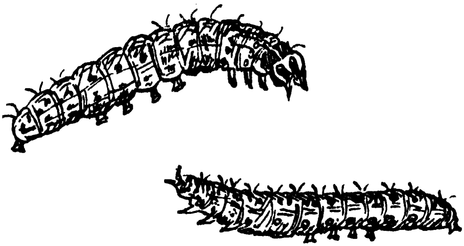

FIG. 33.—Surface Caterpillars.

Pests and Diseases.—If slugs are troublesome, dry soot or ashes should be scattered along the rows. The most destructive insects are surface caterpillars, wireworms, and the larvæ of various cockchafers. If a plant begins to wilt for no apparent reason, it will generally be found, if pulled up and examined, to have been damaged just below the ground level, and if a little soil is scraped away, a fat caterpillar or a whitish shrimp-like grub will often be discovered. If the presence of wireworms is suspected, pieces of carrot, marked with sticks, should be buried and inspected every few days. When they contain wireworms, they should be burned. The chief diseases are lettuce mildew and stem-rot, both of them more prevalent under glass than in the open air. In the former, the leaves turn yellow and droop, a white mould appearing on their lower surface; in the latter, the stem close to the ground is cankered, and a greyish mould spreads over the foliage. In both cases affected plants should be burned and the others sprayed with a solution of permanganate of potash, the water only just tinged.

MAIZE

(*Zea mays*)

Maize, or Indian corn, is comparatively new to English gardens, but it has long been popular in America and, as the result of the impetus given by the war to the cultivation of vegetables of all kinds, it seems likely to become popular here. Formerly the chief difficulty was that, owing to its tenderness, it had so short a season in our climate that it did not mature its cobs; but in recent years this has been overcome to a large extent by the introduction of new varieties of quicker growth.

The food value of maize is nearly the same as that of wheat. The albuminoids (10 per cent.) are rather less, but the fat (nearly 5 per cent.) is nearly three times as much. The other constituents are carbohydrates (starch, sugar, etc.—nearly 67 per cent.) and over 1½ per cent. of salts, the rest being fibre (1½ per cent.) and water (14 per cent.). Of course, when the cobs are eaten green, the proportions are different, that of water being considerably more.

Varieties.—Among the best varieties are Golden Bantam (3½ ft.) for early use, and Country Gentleman (4 ft.) and Howling Mob (5 ft.) for succession.

Preparation of the Ground.—The position chosen should be warm and sunny. As the roots of maize have been traced down to a depth of 6 ft., the ground should be trenched in autumn, and well manured. If only a small quantity of stable manure is available, it should be supplemented by super-

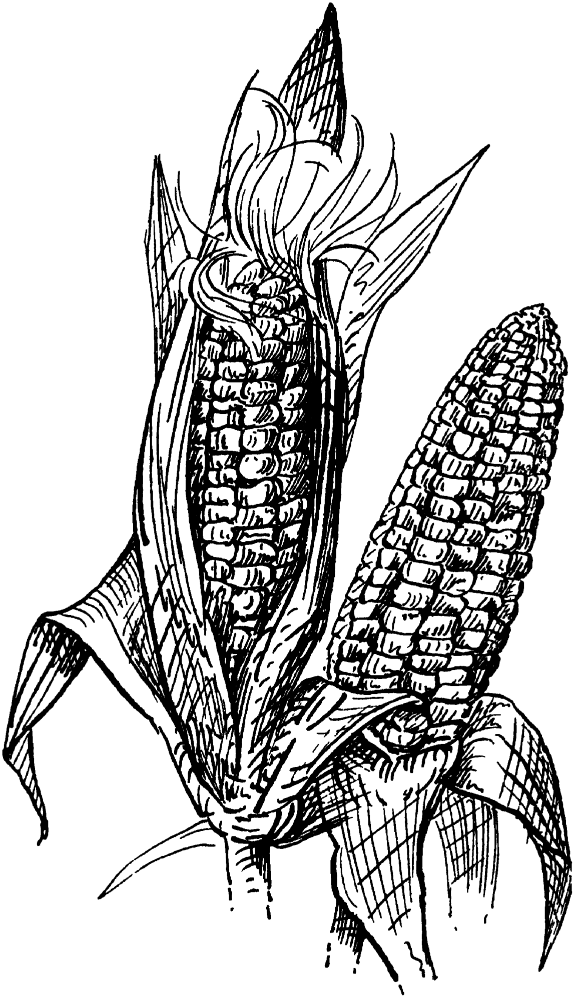

FIG. 34.—Cobs of Maize.

phosphate and potash, and a dressing of nitrate should be applied during early growth.

Cultivation.—In the Midlands and in the North the seeds should be sown in small pots in the greenhouse from the beginning to the middle of April, two or three seeds in a pot. If they all grow it is best to reduce the seedlings to one, the strongest in each case. They should be kept near the glass to make them sturdy, and given fresh air at every opportunity; and as soon as they are likely to be safe from frost they should be planted out 1 ft. apart, with 3 ft. between the rows, care being taken not to disturb the roots. In the southern counties the seeds can be sown outside early in May—6 or 8 in. apart, in drills 2 or 3 in. deep, with 2 ft. between the drills. In exposed districts some soil should be drawn round the stems of the plants to give them additional support, and lessen the risk of their being blown over.

The cobs should be gathered before they begin to ripen and harden. They are ready as soon as white juice will exude from a soft, round kernel under pressure of a finger-nail. In order to keep them soft, they should not be gathered until immediately before cooking. This is done either by removing the stalks and husks and boiling the cobs, without salt, for ten minutes or a quarter of an hour, and then serving with melted butter, seasoned to taste, or by separating the kernels and treating them in the same way.

Pests and Diseases.—There are several diseases to which maize is subject, but hitherto they have not been serious in English gardens. If wireworms or other ground insects prove troublesome, a soil fumigant should be used.

MARROW

(*Cucurbita pepo ovifera*)

The marrow is a variety of the pumpkin (*Cucurbita pepo*), a native of Southern Asia, which was cultivated in the countries along the Mediterranean as far back as the days of Pliny. According to Gerard, the marrow was introduced into Britain from Spain in the latter half of the sixteenth century, for it was apparently the plant called by him the "Spanish cucumber." De Candolle expresses the opinion that it came from South America. Long cultivation in this country has not diminished its susceptibility to frost, and it is still very tender.

The marrow differs very little in composition from the cucumber. It contains about ½ per cent. each of albuminoids, starch, and salts, 2 per cent. of sugar, and 95 per cent. of water.

Varieties.—Custard, Moore's Cream, and Pen-y-byd (small, good flavoured, and very prolific) are three popular varieties. There are also several "Bush" varieties, which are useful for small gardens, as they occupy very little ground.

Preparation of the Ground. — Marrows are often grown on heaps of decaying vegetation covered with soil. Manure is sometimes used instead, but if in large quantity it induces rank growth and coarse flavour, and delays fruiting. It is quite possible to dispense with either if the soil is fairly rich and is kept moist throughout the summer. It may be thrown up into heaps about 6 ft. apart, or left flat after digging, whichever is preferred. The position should be open on the south and west.

Cultivation.—Seed may be sown in heat, in March, in 3 in. pots of light, rich soil, two seeds in each; in a cold greenhouse or frame, about the middle of April; or under handlights in the open air at the end of the month or the beginning of May. The plants in pots should be moved into a larger size when they require more space. At the beginning of June, or, if the weather is warm, a little earlier, they should be turned carefully out of their pots without disturbing their roots, and planted in the positions prepared for them. It is safer to protect them for a time with handlights, or to invert boxes over them at night Marrows require so much water that it is scarcely possible to give them too much in summer, and as soon as they begin to bear, liquid manure should be applied every few days

It not infrequently happens, especially when they are in manure, that they continue growing for a long time without producing female flowers. This is not so common an occurrence with plants that have been raised from old seed as with those raised from new, for which reason any seed not used one season should be kept for sowing the next The production of female flowers can be hastened by stopping the strong-growing leading shoots, and when fruits are formed they will swell more rapidly if the shoots bearing them are stopped at the first or second leaf beyond in each case. By treating some plants in this way, and leaving others unstopped, the supply can be spread over a longer period. Some thinning is usually necessary after a time, for the number of shoots increases so fast that, if left to themselves, they form a dense tangle.

The fruits should be cut while they are young and tender, unless they are wanted for storing in winter, in which case they may be allowed to get large and yellow They will then keep for months At the end of the season, before frost comes, all fruits still on the plants should be gathered and brought indoors.

Pests and Diseases—Grown in the open air under more natural conditions than cucumbers, marrows are generally more healthy, but they are liable to be attacked by the same pests and diseases, especially by blackleg See Cucumber

MERCURY

(*Chenopodium bonus Henricus*)

Mercury, or Good King Henry, is a native perennial. It is cultivated in some of the eastern counties, especially in Lincolnshire, but elsewhere seems little known. Yet it is quite a good vegetable The leaves can be cooked like spinach, while the young shoots are an excellent substitute for asparagus. Indeed, it is sometimes called Lincolnshire asparagus.

As mercury generally occupies the same ground for several years, deep digging and plenty of manure are particularly important. The seed is sown in spring, sometimes in a special bed, the seedlings being planted out when they are large enough, and sometimes in drills about 18 in. apart, the plants being afterwards thinned to 1 ft. or more. The position should be a sunny one. At the end of the season a dressing of decomposed manure should be distributed along the rows. In the following April the shoots which begin to appear—they should be about the same thickness as asparagus—can be cut and served like asparagus, but at first the cutting should be moderate, and should never be continued beyond the beginning of June. The shoots should be used while they are quite young, otherwise they get tough. As already stated, the young leaves can also be cooked like spinach, but a sufficient number for growth must be left on the plants.

If it is desired to increase the stock, this can be done by dividing the roots in autumn or early spring.

A form of mildew is sometimes troublesome in badly drained soils. The affected leaves should be burned, and the plants sprayed with a solution of liver of sulphur (½ oz. to 1 gal. of water).

MUSHROOM

(*Agaricus campestris*)

We have advanced in cookery since the days when it was said that we had only one sauce, but we still have only one mushroom, *Agaricus campestris*, though there are many other species equal, and some superior, to it in flavour. Gerard, referring to the subject, advises "those that love such strange and new-fangled meats to beware of licking honey among thornes, but the sweetnesse of the one do not counteracte the sharpnesse and pricking of the other." And his advice has been generally followed, most persons being careful to avoid eating any other fungus than the common mushroom. It is certainly safest so, for while many species are edible, many others are poisonous, and it is not easy to distinguish them. Mr Massee, in "British Fungi and Lichens," says: "It may be well to state emphatically and at once that the various rule-of-thumb methods, sometimes followed by very unpleasant, if not fatal, results, for the certain discrimination between the edible and poisonous kinds of fungi are absolutely valueless. Among such may be mentioned the old statement that all fungi having a skin that can be peeled off the cap, as in the common mushroom, are edible. This statement is not correct. Again, it is said that if a silver spoon, placed along with the fungi when cooking, turns black, it is a sign that such fungi are poisonous. This, again, is not correct." Dr Cooke's dictum on this point is as follows: "Eat them; if you live, they are edible; if you die, they are poisonous." Those, therefore, who are not experts, had better confine themselves to the common mushroom. Nevertheless, many different kinds of edible fungi were recognised and prized by the ancient Greeks and Romans, especially the Boletus, and some, if not all, of them are still eaten on the Continent.

The mushroom contains 5 per cent. of albuminoids, nearly 4 per cent. of carbohydrates (starch, sugar, etc.), ¾ per cent. of fat, ½ per cent. of salts, and 90 per cent. of water. On these figures its food value would appear to be remarkably high, but it sinks very much lower in the scale if we take into consideration only the amount of the nutritive materials which can be assimilated by the human body. On this basis Professor Atkinson compares beef, cabbage, and mushroom, and gives the following percentages: beef, 1.87 of albuminoids and .88 of fat, equal to 7,200 calories; cabbage, .18 of albuminoids, .03 of fat, and .49 of carbohydrates, equal to 1,400 calories; and mushroom, .18 of albuminoids, .03 of fat, and .46 of carbohydrates, equal to 1,316 calories. If these percentages are correct, the actual food value of the mushroom is rather less than that of the cabbage, and less than a fifth of that of beef.

Preparation of the Bed.—Mushrooms are difficult to manage in very cold weather, and in hot weather they become infested with maggots. It is advisable, therefore, to grow them in seasons when the temperature is more moderate, and as they take ten or twelve weeks (sometimes more and sometimes less) to develop after the spawn has been inserted, and continue in bearing for about the same period, the best times for making the beds are the end of July and the end of December. If a shed is available for the purpose, less manure is needed than in the open air, and the expense of covers to keep off heavy rain is saved.

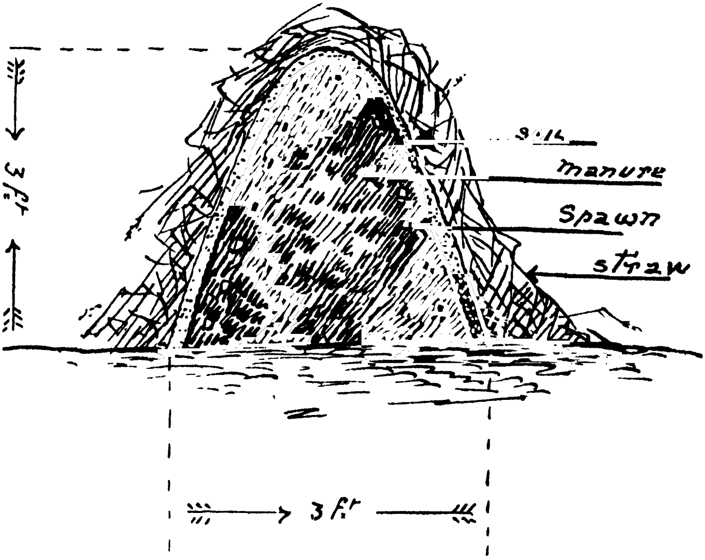

FIG. 35.—Section of Mushroom Bed.

The manure should be fresh from the stable. If it has been kept for some time it will have lost some of its heat. It should be forked over carefully and shaken free from all lumps, some of the long clean straw being placed in a heap by itself. In order to ensure uniform heating, this operation should be repeated twice or thrice on alternate days. The bed should then be made up; if in the open air, in the form of a ridge (so as to run off heavy rain) about 3 ft. wide at the bottom and 3 ft. in height, the top slightly rounded. Under cover the shape of the bed is of less consequence; it may be flat, if that is most convenient. Each layer of manure should be trodden well down as it is put on and, finally, the surface should be beaten smooth with the back of the spade.

Cultivation.—Mushroom spawn is sold in the form of flat, square cakes of manure, similar in shape to dog biscuits, but about twice as thick, sixteen of them being regarded as equivalent to a bushel. These bricks, as they are called, should be permeated by the white cobweb-like threads of the mycelium. When they are old and worthless, they have a musty smell, and the threads run together in small globules. When the temperature of the bed, as shown by a thermometer inserted in it, has fallen to 90° F. or rather less, each brick should be broken up into about eight pieces, which should be pressed firmly 4 or 5 in. apart into the manure. Two bricks should be sufficient for about 1 sq. yd. of surface. When the operation of spawning is completed, beds in the open air should be covered with the long clean straw set aside for the purpose. Three or four days later it should be taken off, and the bed surfaced with 2 in. of moist loam, which should be beaten smooth, the straw being afterwards replaced. Though the steep slope of the beds will throw off most of the rain that falls on them, it is often necessary to protect them by means of sheets of corrugated iron or something similar, especially in case of snow. If the manure becomes very dry, it should be watered with lukewarm water; but this should not be done unless it is absolutely necessary. In cold weather the straw covering should be increased in thickness, and only a little of it should be removed at a time, when the mushrooms are being gathered.

There are various other ways of growing mushrooms—for instance, in a greenhouse in pots, or boxes of manure covered with soil and placed where they will not be rapidly dried by sunshine. A hot-bed for cucumbers can also be utilised, spawn being inserted in the manure under the shade of the foliage at the end of July, and when the plants are cleared away, straw being laid over the bed. Even a lawn can be made to serve the same purpose. About the end of May the turf should be raised here and there with the spade, and, manure having been substituted for a little of the soil underneath, a quarter of a brick should be pressed in and the turf replaced on top. In this case, of course, the result will depend on the weather. If it is favourable, there may be quite a good crop at the end of summer; but even if it is unfavourable, there is no need to regard the spawn as wasted, for mushrooms may appear in subsequent years.

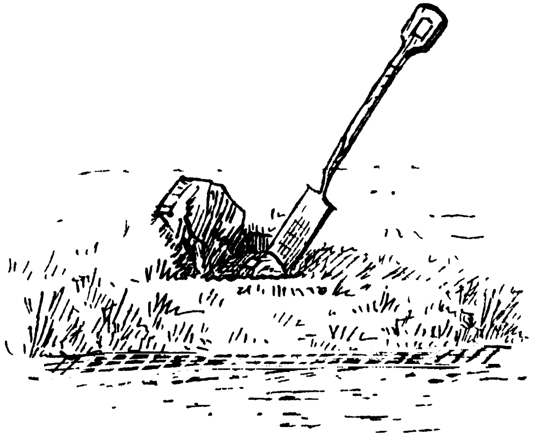

FIG. 36.—Inserting Mushroom Spawn in the lawn.

Pests and Diseases.—Mushrooms are sometimes badly damaged by slugs and woodlice. The pests can usually be found by a careful examination of the bed. Watering with a solution of salt (1 oz. in 1 gal. of tepid water) is useful, especially as it destroys millipedes and other injurious creatures which not infrequently infest the manure.

Mushroom mould, characterised by white gelatinous tufts, the affected caps becoming scaly, and another disease which spreads in a dense mycelium over the mushrooms, causing distortion and decay, are both incurable. In bad cases the beds should be broken up. If they are in a house or any other place where mushrooms are likely to be grown again, the infected area should be sprayed with a strong solution of sulphate of copper, 1 lb. in 15 gals. of water.

ONION

(*Allium cepa*)

The popular name is derived, through the French *ognon*, from the Latin *unio*, meaning a large pearl, but applied to the vegetable by Columella in his "De Re Rustica," written at the beginning of the first century A.D. The onion is supposed to be a native of Central Asia, but as it was cultivated long before the Christian era, there is no certainty as to its origin. Theophrastus gives it the Greek name *kormuon*, and Pliny, Horace, and other writers call it *caepa*, or *cepa*. As stated in connection with the leek, it was venerated by the ancient Egyptians, and at the present day there is no other vegetable which gardeners are so proud of growing to a large size. It is the most valuable of all our crops, not infrequently fetching £100 an acre, and sometimes more.

The onion contains 1½ per cent. of albuminoids, nearly 5 per cent. of carbohydrates, ½ per cent. of salts, and 91 per cent. of water. One of its constituents is a pungent, sulphureous, volatile oil, to which it owes its stimulating properties. Most of the oil disappears during the process of boiling, for which reason onions so treated are much milder in flavour than when they are eaten raw.

Varieties.—Onions are divided by seedsmen into several classes. There is the Italian or Tripoli class, which is mild in flavour, soft in texture, and does not keep long. It is usually sown in autumn. Giant Rocca and Globe Tripoli are two of the most popular varieties. Then there is the flat-bulbed class, represented by White Spanish, Giant Zittau, and Rousham Park Hero (not quite so flat as the others). The globular varieties include Ailsa Craig (probably the first favourite in all classes), Bedfordshire Champion, and James' Keeping. Finally, there are the smaller, silver-skinned varieties, generally grown for pickling, one of the best being the Queen. The potato onion requires the same treatment as the shallot.

Preparation of the Ground.—The most suitable soil is good loam. If it is light, it should be trodden down firmly or rolled before sowing, otherwise the plants make an excessive amount of top-growth, and the bulbs are small. Deep digging in autumn or winter is essential, and manure should not be stinted. In the Hadlow experiments potash increased very little, if at all, the effect of stable manure; but when artificials were used alone, the crops were a failure without it. On the whole, the report recommends "A moderate dressing of dung (twenty-five loads, or 12 to 13 tons per acre), accompanied by 4 to 6 cwt. of superphosphate (or its equivalent in other phosphate manures), 1 cwt. of sulphate of potash (or 4 cwt. of kainit), and 2 to 4 cwt. of nitrate of soda per acre, the quantity of the latter being determined by the season and the appearance of growth. The nitrate should be applied as a top dressing, and if 4 cwt. is given, it should be divided into two dressings, with an interval of a few weeks between them, the first being given when the crop is thinned." It is probably best to divide all dressings of nitrate into two portions, and to give them at different times during growth.

Cultivation.—An ounce of seed should be sufficient for a row from 80 to 100 yds. in length. If, however, it is sown in boxes and the seedlings are planted out, it should go much farther. With a warm greenhouse or a hot-bed, a start can be made in January. The seed should be sown thinly in boxes of fine, rich soil, and when the young plants are 4 or 5 in. high they should be picked out about 2 in. apart in other boxes. About the end of March they should be moved to a cold frame and given plenty of air to harden them off, and two or three weeks later, if the weather is mild and the ground is in suitable condition, they should be carefully lifted with as little root disturbance as possible, and planted out 1 ft. apart, with 15 in. between the rows, the operation being completed by a thorough watering. By this method very large onions can be grown.

They are naturally smaller if the seed is sown in the open ground in March—in shallow drills about 1 ft. apart; but with good treatment they should still be of a very useful size, and there is a saving of labour. Unless, however, the seed is sown very thinly, there is likely to be a good deal of waste, though the thinnings can be used in salads. The plants left to grow should be 6 or 8 in. apart. Water should be provided during dry weather, and liquid manure at frequent intervals. Soot is an excellent dressing, for it not only supplies food, but also keeps insects away. Feeding should not be continued after the middle of July, otherwise it may stimulate growth beyond the time at which it should cease, and thus interfere with ripening. The hoe should be used frequently throughout the season in order to let air into the ground, as well as to destroy weeds; but afterwards, and also after thinning, the ground should be made firm again along the rows. About the middle of August, or rather earlier, if the foliage begins to lose its fresh green colour, the back of the rake should be drawn over the plants so as to lay all the tops flat and confine any further growth to the bulbs. For the sake of neatness, all the tops should be laid in the same

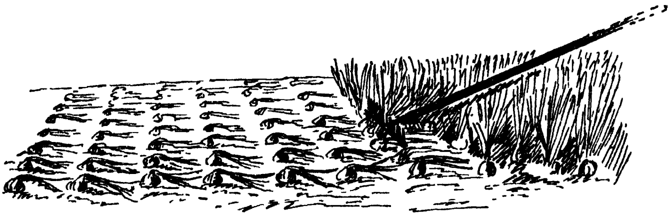

FIG. 37.—Laying Onions with the Back of the Rake.

direction. When they wither, a warm, sunny day should be chosen for pulling up the bulbs. They should be left on the ground for a few hours to dry, thoroughly cleaned, and tied together in strings, so that in fine weather they can be hung up in the open air. When they are quite dry, they can be laid thinly on shelves or hung up in a shed or in a kitchen. If properly ripened, they will not be injured by frost.

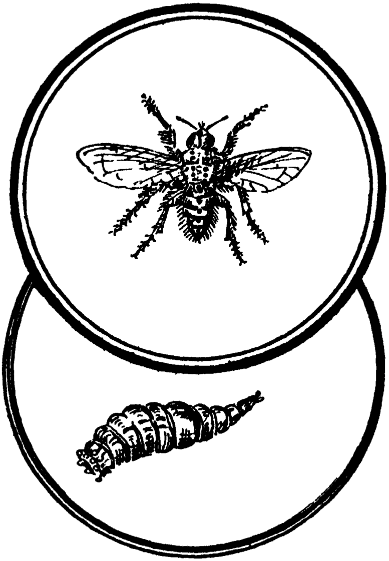

FIG. 38.—Onion Fly and Larva (enlarged).

When large onions are wanted in gardens where neither a warm greenhouse nor a hot-bed is available, the seed should be sown in drills at the beginning of August. The seedlings should be examined after frost, which loosens them in the ground, and early in April they should be planted out in rows in the same way as those reared in boxes in heat. They are rather liable to run to seed, especially in a dry summer, and to prevent this they must be abundantly supplied with food and water. If their growth is checked, the mischief is done.

What are called Onion Sets, really small bulbs, are sold by most seedsmen. If they are obtained in early spring, they should be planted and treated in the same way as recommended for autumn sown plants.

Pests and Diseases.—The onion fly is the most serious pest. In April or May it lays its eggs on the leaves of the young plants, and the tiny white maggots, when hatched, work their way down into the bulbs, which are consequently spoiled and soon decay. As the maggots seem unable to reach the bulbs when the ground is quite firm, it should always be trodden down after hoeing and thinning. Sprinkling with soot and also spraying with paraffin emulsion—made by churning 3 pints of paraffin and ½ lb. of soft soap in 1 gal. of hot water, and afterwards adding 6 gals. of cold water—are both useful for keeping the flies away, while a dressing of kainit at the rate of 5 cwt. to the acre is also recommended. As an additional precaution, onions should not be grown on the same ground in successive seasons. If these measures are not successful in getting rid of the pests, seed should be sown, not in spring in the open air, but in autumn, or else in a greenhouse or in a hot-bed early in the year. The plants are then older and have tougher skins at the time when the flies lay their eggs, and in consequence they are rarely damaged.

There are five fungoid diseases which are fairly common. The least injurious is onion scab, characterised by black patches on the outer coatings. The bulbs are not affected inside, but should not be stored with healthy ones. Onion mildew is a disease of dull, damp weather; white or grey furry patches appear on the leaves, and the bulbs are long-necked, and do not swell. The bed should be sprayed with a solution of sulphate of iron, 3 parts of the sulphate to 100 of water. Onion smut attacks only young plants, the black streaks appearing first on the outer leaves. In onion rust the streaks are brown, and the leaves soon wither. In bulb sclerotinia they develop very early in the season, at first yellow and afterwards brown, and in the later stages blackish warts can be seen inside the bulbs. In these three cases spraying with a solution of liver of sulphur (½ oz. to 1 gal. of water) may check the disease, but all badly affected plants should be pulled up and burned.

PARSLEY

(*Carum petroselinum*)

Parsley is classed as a hardy biennial, but while the roots are rarely killed in winter, the foliage is destroyed by severe frost. It came originally from a warmer climate than ours, though it is now naturalised in certain districts. It is supposed to have been introduced from Sardinia in the first half of the sixteenth century. Along the shores of the Mediterranean it grows among rocks and on walls; hence its specific name *petroselinum* (meaning rock parsley), from which the English popular name, like the French *persil*, is derived. It is called *Carum* by Dioscorides. Parsley is a near relative of the caraway (*C. carvi*), a native of Caria, in Asia Minor, and now also naturalised in this country. In appearance it has been much altered by cultivation. As the result of growth in rich garden soil, the leaves produce so much tissue that they have become remarkably crisped and curled.

Though parsley is regarded as a garnish rather than as a vegetable, it stands fairly high in the scale of food values. It contains over 3½ per cent. of albuminoids, 7½ per cent. of carbohydrates, and over 1½ per cent. of salts, together with 85½ per cent. of water.

Varieties.—There are several very much alike, but Moss Curled is a general favourite.

Preparation of the Ground.—As parsley is tap-rooted, the ground should be deep and rich, preferably good loam which was well manured in autumn or winter. In partial shade the plants make better growth than in full sunshine, and do not run to seed so soon. They are not infrequently used as an edging for a plot in the kitchen garden. This position has its advantage, for when they are close to a path the leaves can be easily gathered, and they are generally wanted many times in the week during the season.

Cultivation.—One ounce of seed should be sufficient for a row 30 yds. in length. As it is slow in germinating, often taking as long as six weeks, it should be sown in a shallow drill as early in the year as the weather and the soil will permit—at the beginning of March, if not before—and the plants should be thinned out to about 6 in. apart. Water should be given in dry weather, and liquid manure at frequent intervals. The greater the amount of food—of course, within reasonable limits—the finer the foliage, which in poor soil loses much of its curled character. Towards the end of summer it becomes old and coarse, and at the beginning of September the plants should be cut down to 4 or 5 in. from the ground. If the soil is dry at the time, they should be thoroughly watered. They will then produce a fresh crop of young leaves.

Where much parsley is wanted, it is a common practice to make a second sowing in July or August. For winter use some of the plants should be moved in October into a cold frame, or they may be put in boxes or pots and taken into the greenhouse.

Pests and Diseases.—During dry weather, parsley, if neglected, is sometimes infested with aphides. They should be syringed off with soapy water. Two diseases attack the foliage—rust (yellow or brown warts) and leaf-scorch (black spots which rapidly increase in number, and coalesce). In both cases the affected leaves should be taken off and burned, and the plants sprayed with a solution of liver of sulphur (½ oz. to 1 gal. of water). Parsley rot is a still more serious disease. A white mycelium spreads round the plants, which decay at or just above the level of the soil. They should be dug up and burned, and parsley should not be grown again on the same ground for two or three years.

PARSNIP

(*Peucedanum sativum*)

The wild parsnip is a native of Britain and other countries in Northern Europe and Asia. In its cultivated form it was known to the ancient Greeks and Romans, but it is not always clear whether the names Daucos, Staphylinos, Elaphoboscum, Peucedanum, and Pastinaca used by Hippocrates, Theophrastus, Dioscorides, and other writers, refer to it or to the carrot Probably, however, Pliny, when speaking of a kind of Pastinaca with a pungent flavour difficult to get rid of, meant the parsnip, for the wild species is very pungent The effect of cultivation was shown by Professor Buckman. In 1848, while at the Cirencester Agricultural College, he collected seed from some wild parsnips, sowed it in rich garden soil, saved seed from the best of the plants thus produced, and sowed it again, and so continued for a number of generations In this way he obtained an excellent variety with a long, straight, fleshy root, free from its original pungency, and quite equal, if not superior, to any other variety in existence It was put on the market under the name of The Student. It has been further improved since then, and is to be found in every seedsman's list Thus in comparatively few years, merely by cultivation and selection, the parsnip has been brought as far from its starting-point—the wild stage—as in the many centuries that had gone before

Though it is a favourite vegetable with many persons, there are some who do not care for it Gerard preferred to leave it to others "There is a good and pleasant foode or bread," he writes, "made of the rootes of parsnaps, as my friend, Master Plat, hath set foorth in his booke of experiments, which I have made no triall of, nor meane to do" Nevertheless, Gerard admits that "The parsnaps nourish more than do the turneps and the carrots" Indeed, they have a very high food value, for they contain rather over 1 per cent of albuminoids, 8½ per cent of carbohydrates (of which 3 per cent is sugar, as against 4½ per cent in the carrot and 10 per cent in the beet), 1½ per cent of fat, and 1 per cent of salts, with 82 per cent of water

Varieties—Hollow Crown and The Student are both good

Preparation of the Ground—The most suitable soil is sandy loam It should be prepared as for carrots—deeply dug or trenched in autumn or winter, and left rough in order to expose as large a surface as possible to the weather. If a heavy dressing of stable manure—say fifty loads or 25 tons per acre—was given to the previous crop, it would appear from the Hadlow experiments that no more manure of any sort is necessary; but if the dressing was only a light one, 4 to 6 cwt. of superphosphate per acre (or 8 cwt. of basic slag) and 1 cwt. of sulphate of potash (or 4 cwt. of kainit) should be hoed in before sowing, and 2 cwt. of nitrate of soda should be applied as a top dressing at the time of thinning. The importance of potash was shown by the experiments. The report says: "If good results are to be obtained from the phosphates and nitrate of soda, or whatever nitrogenous manure may be used, it is essential that potash salts should be included in the dressing for the crop." If stable manure must be applied for parsnips, because little or none was used for the previous crop, it should not be distributed about the ground, for that would cause the roots to fork, but should be laid at the bottom of a trench in order

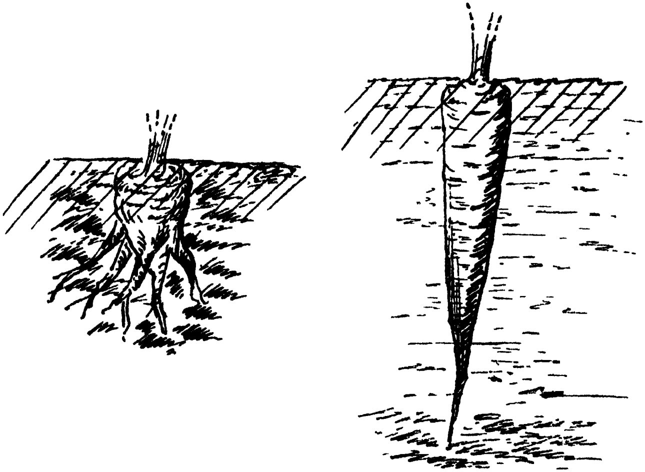

FIG. 39.—Parsnip forked among manure (left), and another growing straight down towards manure laid at the bottom of a trench.

to induce them to grow straight down towards it. In very heavy land it is difficult to grow good parsnips, unless, as recommended under similar conditions for carrots, holes are made with the dibber—6 or 8 in. apart, with 15 or 18 in. between the rows—and filled with light, rich soil, a few seeds being sown in each, and the seedlings ultimately reduced to one.

Cultivation.—One ounce of seed should be sufficient for a row 60 yds. in length. In order to allow a long period of growth it should be sown—in shallow drills from 15 to 18 in. apart—in February, if the soil is then in suitable condition, or early in March. Frost will not injure the seedlings. They should be thinned out to 6 in. apart or rather more, the nitrate dressing previously mentioned being applied at that time. An occasional hoeing is all the attention the plants require afterwards. In October the roots should be ready for use. As they are improved by frost, they are usually left in the ground during the winter, unless it is very heavy and wet; but before severe weather makes lifting difficult, it is advisable to store a supply under cover, or else to protect part of the bed with litter.

Pests and Diseases.—For insects injurious to the parsnip, see Carrot and Celery. The same pests attack all three vegetables, which should not, therefore, follow one another on the same ground. Two fungoid diseases are sometimes troublesome—leaf-blight (described under Celery) and rot mould, which causes white patches on the lower side of the leaves. In both cases the affected leaves should be taken off and burned, and the plants sprayed with Bordeaux mixture.

PEA

(*Pisum sativum*)

The edible pea certainly originated in a warmer climate than ours, probably in Western Asia, from which it spread to Southern Europe, but the wild form is unknown. It was cultivated by the ancient Greeks and Romans, and is mentioned by Pliny as being too tender to stand the winter in Italy. It is supposed to have been introduced into this country in the first half of the sixteenth century, but does not seem to have established itself as a popular garden vegetable until more than a hundred years later.

Peas, when green, contain nearly 6 per cent. of albuminoids, about 11 per cent. of carbohydrates, ½ per cent. of fat, and ¾ per cent. of salts. Of course, when they are dried, the proportions are much greater. Their food value is therefore very high.

Varieties.—There are so many varieties on the market, all of them good in one way or another, that selection is difficult. Some are dwarf, and others tall. With the former, which are especially valuable for very early or very late crops, the expense and labour of staking are avoided; but the latter, which are generally preferred for midsummer supplies, naturally produce larger pods and many more of them. Of the earliest class, English Wonder and Excelsior grow rather over 1 ft. in height, and Gradus and The Pilot about 3 ft.; of the second earlies, The Sherwood, between 1 and 2 ft., and Telephone, 5 ft.; and of the late varieties, The Gladstone, 4 ft., Autocrat (one of the finest for flavour), 5 ft., and Quite Content (the largest), 6 ft. Of course, the heights vary in different seasons and in different gardens.

Preparation of the Ground.—For all peas, especially for the tall varieties whose roots go deep, the ground should be deeply dug or trenched in autumn. For this reason it is a good plan to grow them on a plot which in the previous season was occupied by celery. By means of the bacteria which form nodules on their roots, peas are able to obtain nitrogen from the atmosphere, so it is not generally considered necessary to supply them with more. This is corroborated by the Hadlow experiments. Two plots were treated with twenty-five loads of stable manure per acre, with the usual addition of phosphate and potash, one of the plots also receiving 2 cwt. of nitrate of soda per acre, and the other none. As the average result of eleven seasons, it was found that the crop on the nitrate plot was no larger than that on the other. In other words, the nitrate produced no gain in weight. The report, however, says that "The peas matured with nitrate of soda have been, when cooked, distinctly softer, sweeter, and of brighter colour than those grown without the use of nitrate." Whether this is an adequate return for the additional expense, each gardener must decide for himself.

Cultivation.—A pint of dwarf peas should be sufficient for a row 20 yds. in length, and a pint of tall for a row of 30 yds. The earliest varieties should be sown in February or March, when the conditions are favourable, the drills being made with the full breadth of the hoe, those for dwarfs about 2½ ft. apart, and for the taller varieties 3 ft. or more. If the distance in the latter case is 5 or 6 ft., the ground between can be utilised for other crops, especially for those requiring some shade, such as lettuce and spinach. It is essential that the peas should be protected from mice and birds. With this object they are sometimes soaked for a few minutes in paraffin, or moistened and rolled in red lead, or treated in other ways; but the effect of such treatment is only temporary. It disappears after germination commences, and that is the time when the seeds are most liable to be damaged. There is only one satisfactory way of protecting them from birds, and that is to cover the rows with wire guards, or else to stretch black cotton along them, three strands about 3 in. above each row. Though birds eat the young shoots issuing from the germinating seeds, they do not damage those of the growing plants, the reason being that the latter contain a bitter principle which is distasteful to them. If the soil is trodden down along the rows, the shoots do not appear above ground until this principle has begun to develop in them, and they are then left unmolested. This method can be practised in some gardens with light soil; but in others it is impossible, and of course it delays the crop. Mice must be trapped, otherwise they tunnel along the rows, eating every seed. They can easily be caught in traps baited with cheese rind.

Second earlies and maincrop varieties should be sown at frequent intervals—say once a fortnight—during the spring and up to the end of June, when a dwarf variety should be sown again for a late crop.

Tall peas should be staked when they are a few inches high, the best stakes for the purpose being hazel branches with plenty of twigs. They should be driven in firmly in two lines, one on each side of every row, and in order to support one another they should not be upright, but every alternate one should slope towards the same end of the line, the others sloping towards the opposite end. Afterwards, the trodden ground should be loosened with the hoe, and a little of the soil drawn round the plants. With care the stakes should last for two seasons, but they then get so brittle that it is unsafe to use them, and they should be broken up for firewood.

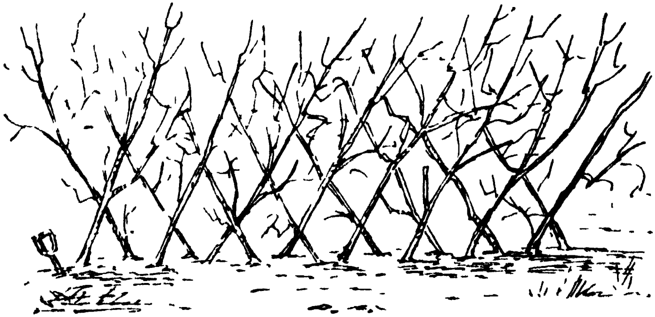

FIG. 40.—Stakes for Peas.

It is in the latter part of the season that any deficiency in manure makes itself most obvious. The plants begin to fail after they have been a short time in bearing, especially if the pods are allowed to get old; whereas, if their roots are in well-manured soil which provides them with food and moisture they keep on growing and fruiting very much longer. They use up so much material in producing their pods that it is advisable in any case to give them liquid manure at frequent intervals.

Pests and Diseases.—There are many insects which injure this crop, among them being the maggots of the pea moth and the pea midge, various weevils, aphides, and several ground insects such as wireworms and millipedes. For aphides, the plants should be sprayed with soapy water; wireworms and millipedes can be trapped in pieces of carrot buried in the ground 1 or 2 in. below the surface, and examined every few days; lime or soot scattered along the rows will keep the weevils away; and soapy water with a dash of paraffin sprayed over the haulm will lessen the depredations of the moths and midges. After each crop is gathered the haulm should be burned, and the surface soil turned in rather deeply in order to bury any insects in it.

The commonest fungoid diseases are mildew, pea spot, seedling pea blight, and black root rot. Mildew is easily recognised by the filmy white or grey appearance of the leaves. The plants should be sprayed with a solution of liver of sulphur (½ oz. to 1 gal. of water), and, as in all diseases which are not incurable, should be helped to grow strong by attention to their requirements in food, water, and so forth. For pea spot (large, pale blotches with darker spots on the pods and sometimes on the haulm), a stronger fungicide, such as weak Bordeaux mixture, is necessary; but to be effectual it must be used at an early stage. Seedling pea blight causes spots of dark mould on the leaves, which soon wither. It attacks only young plants, which should be pulled up and burned. Black root rot is a disease of wet land. The roots blacken, the leaves wither, and the plants die. No cure is known. Peas should not be grown on the same ground again for several years, and it should be properly drained.

POTATO

(*Solanum tuberosum*)

The history of the potato is remarkable. Though the original species has not been identified, it is supposed to have been brought, in the early part of the sixteenth century, by the Spaniards to Europe from Mexico or Peru, where it was cultivated by the natives, the Indian name for it being

Batatas, which has since become Anglicised into potato. We hear of it later in Italy, Austria, and Belgium, but merely as a curiosity. Clusius gives an illustration of a plant bearing flowers, fruit, and small tubers of irregular shape. It seems to have been introduced into this country three times—by Hawkins in 1565, by Sir Francis Drake in 1585, and by Sir Walter Raleigh (really by Thomas Herriott, who accompanied him) in 1623. But it attracted so little attention that, in a gardening book published nearly a century later, it is not even mentioned. Its cultivation, however, had already commenced in Ireland, and from there it spread to Lancashire and Scotland. Some years afterwards it was taken up in France and Germany. At last its value was recognised; the potato was coming into its kingdom.

It is the most important of all garden crops, but as a flesh-former it is much inferior to legumens and cereals, its chief constituent being starch. It contains only a little over 2 per cent. of albuminoids, but as much as 19½ per cent. of carbohydrates (starch, 15 per cent), with a trifling amount of fat and 1 per cent. of salts, of which more than a half is potash, a point which should be remembered in connection with manuring. Some common salt should be added to the water in which potatoes are boiled, as it lessens the wastage of the valuable salts which enter into their composition. It is better to boil them in their skins than after peeling them, and better still to bake them. It is true that one of their constituents, solanin, is injurious, but it occurs in them in very small quantities, and is destroyed by heat.

Varieties.—As the potato has been for many generations propagated mainly by means of the tubers, it has almost entirely lost the power to produce seed, which is used only for the purpose of obtaining new varieties. The tubers may be likened to the plantlets on the runners of the strawberry. A variety is therefore merely a single individual, all the tubers of the same name being portions of it. Some authorities hold the opinion that as the result of this asexual method of propagation, every variety deteriorates in the course of time; but this has never been proved, and some varieties which have been in existence for a great many years are still popular. Another theory is, that if the same stock is grown continuously on the same ground, deterioration sets in. It may be true, and a frequent change of "seed"—the trade name for small tubers for planting—is generally advised. If possible, the "seed" should be obtained from Scotland or Ireland, because it gives a larger yield than "seed" from the South of England, the reason apparently being that owing to climatic differences it is not so much dried or ripened.

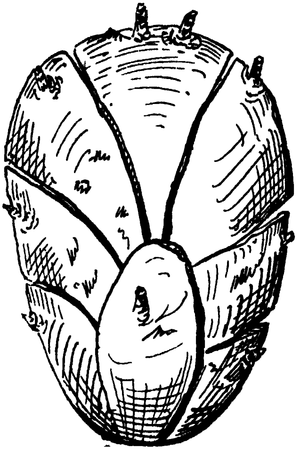

FIG. 41.—Potato divided into sets, each with one or more eyes.

New varieties are put on the market almost every year, but the following have stood the test of time:—First earlies—Sharpe's Express, Midlothian Early, and Myatt's Ashleaf (one of the best for flavour). Second earlies — British Queen and Duchess of Cornwall. Maincrop — The Factor, King Edward VII., and Arran Chief. In districts in which wart disease has occurred, the following, which are classed as immune, should be preferred—First earlies—Great Scot and King George V. Maincrop—Golden Wonder and The Lochar.

Preparation of the Ground.—It is a good plan to choose for potatoes a plot occupied in the previous year by tall peas, as the latter not only deepen the ground but also increase the amount of nitrate in it. Potatoes are also the best crop for newly broken up grassland, because the dense haulm smothers most of the weeds that spring up, while those that remain are destroyed by earthing up and hoeing. In the Hadlow experiments fifty loads of stable manure per acre, dug in during the autumn or winter, produced the best results with earlies; but the yield was not very much less, and the cost was considerably reduced when only half the amount of stable manure was used, supplemented by potash (1 cwt. of the sulphate or 4 cwt. of kainit) and phosphate (4 cwt. of superphosphate or 8 cwt. of basic slag), with the addition of 2 cwt. of nitrate of soda applied before earthing up. For maincrop varieties the latter dressing proved the best, an extra 2 cwt. of nitrate of soda being used at the time of planting. It may be mentioned that the average weight of the potato crop throughout the country is rather over 6 tons per acre (or rather over ¾ cwt. per rod); but with good cultivation in well-manured garden soil that amount should be exceeded for earlies, while the yield of maincrop varieties should be 10 tons per acre (or 1¼ cwt. per rod), or more.

Cultivation.—The most economical size for seed tubers has been found to be about 2 oz. in weight, about as large as a hen's egg. If they are much smaller, the crop is reduced; if much larger, they are wasteful, as the increased quantity required for planting does not produce a proportionate gain. When tubers of the size mentioned are used, a rod will take about 22 lbs. of earlies, or about 9 lbs. of a maincrop variety, the distances for the former being 1 ft. between the tubers and 1½ ft. between the rows, and for the latter 1½ ft. between the tubers and 2½ ft. between the rows. When the tubers are too large they are sometimes cut into what are called "sets." With some varieties this is quite satisfactory, but with others it is not. Each set should contain two or three "eyes" or buds, preferably at the thicker end of each tuber, because the sprouts from that part are generally the strongest. Cutting should always be done a day or two before planting, in order to allow the wounds to dry and harden, otherwise they offer an easy entrance to disease germs and insects. For the same reason dusting the wounds with lime has been recommended.

Experiments have been carried out at different times and in different parts of the country to ascertain whether there is any advantage in "boxing" or "sprouting" the tubers before planting them. This is done by packing them, with the thicker ends upwards, in shallow boxes, and exposing them to the light for a few weeks in a cool greenhouse or in a room or shed where they are safe from frost. As the result of this treatment they develop a number of sturdy sprouts. In most cases there are too many sprouts; the weakest should be rubbed off, and only about three of the strongest left. The general conclusion from the experiments is that, with earlies, "boxing" causes a decided increase in the crop, but that with maincrop varieties, which have a longer period of growth, there is little or no gain.

If the weather and the soil are suitable, planting may commence in the southern counties in the first or second week in March, but in cold districts it is safer to wait until the following month. The garden line should be put down to mark the positions of the rows, and holes made along it with the dibber at the distances given above, or rather less for short haulmed earlies, such as Myatt's Prolific. The dibber should have a broad point, in order to let the tubers rest on the bottom of the holes, and not be suspended in the air. As regards depth, it should vary according to the nature of the land. Besides supplying food, the soil has to serve two other purposes—to keep the roots moist and to preserve a fairly even temperature. Obviously, if it is light and dry, a thicker soil covering is required than if it is heavy and wet. For light soil, a depth of 6 in. is sufficient. It should be less for heavier soil. On wet, undrained land it is best to plant right on the surface, afterwards making a slight ridge with the

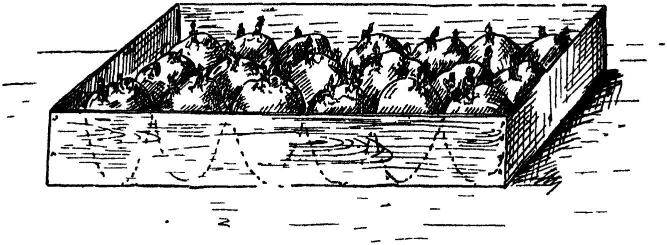

FIG. 42.—Potatoes sprouting in box.

hoe, and adding to it more soil as required. The tubers are thus kept above the water level, and when much rain falls, it drains away from them. In other cases they should be dropped, thick ends upwards, into the holes, which should then be filled by pressure of the foot or the dibber. If the sprouts come through the ground so early that there is danger of them being injured by frost, they should be lightly covered with soil, and until they are safe, the operation should be repeated as often as may be necessary. Of course, there must come a time when they grow too tall to be protected in this way; but if they are damaged then, fresh growth soon starts up from the unharmed buds below the surface, and the crop is only slightly retarded. When the rows can be seen, the hoe should be used among them in order to loosen the soil and to kill any weeds.

The plants should be earthed up before they begin to "run"—that is, to throw out the runners or stolons on which the young tubers are formed. The usual time is when they are about 6 in. high, or, in the case of tall maincrop varieties, rather more. The object is threefold—to support the haulm, to protect the young tubers from the light which would turn them green and make them unfit for eating, and to run off heavy rain which might cause disease. The last of these objects is best attained by making the ridges rather steep and smooth. Care must be taken not to insert the hoe so close to the plants as to injure the roots. If a fertiliser such as nitrate of soda is to be used, it should be scattered along the rows just before earthing up, but it must not be allowed to fall on the leaves, for it would burn them. If desired, soot, at the rate of ½ bushel to the rod, can be substituted for nitrate of soda or sulphate of ammonia. It should have been previously exposed to the air for a few days.

Early varieties grown for the production of young potatoes may be lifted as soon as the tubers are large enough to cook. They should be ready about the beginning of July. Maincrop varieties should not be lifted until the haulm withers, a fine day being chosen for the purpose. They should lie on the ground for a few hours to dry, and then be rubbed free from soil, and sorted into four sizes—large (for baking), medium (for boiling), small (for seed), and very small (useless except for pigs and poultry) with any that happen to be diseased. The two larger sizes should be carried to a shed and stored separately—preferably in boxes lined and, when filled, covered with straw. The third size may remain on the ground for a few days, for seed tubers are not injured by exposure to light; but eventually they should be stored like the others. The smallest should also be collected and taken away. If any of them are overlooked, they will grow among other crops in the following season, and thus become a nuisance. Every diseased tuber and all the haulm should be burned. It is essential that the stored potatoes should be protected from frost, and at the approach of severe weather it may be necessary to increase the thickness of the straw around them. Once or twice during the winter—but not during hard frost—they should be examined, and if any bad ones are found, they should be removed. A sprinkling of lime is useful in preventing the spread of disease among them.

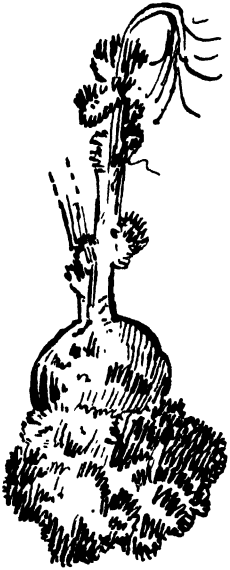
FIG. 43.—Black Scab of Potatoes (wart disease).

When potatoes are in large quantities, they are often stored in "clamps"—that is, piled together in rather steep ridges, which are then covered with soil, and thickly thatched with straw. If the work is carefully done, they will keep quite well in this way; but as the "clamps" are in the open air, they cannot safely be opened when the temperature is very low.

Pests and Diseases.—A large number of insects attack potatoes, among them wireworms, millipedes, and the larvæ of various cockchafers, crane flies, and moths; but it is not often that they do very much harm. Their numbers can be reduced by applications of soot and lime. Fungoid diseases are much more serious. One of them, wart disease, which is very destructive and infectious, must be notified to the Board of Agriculture as soon as its presence on any land is discovered, failure to do so entailing "a penalty not exceeding £10." As the Board sends an inspector to deal with the matter, there is no need to say more than that the disease can be recognised by the rugged warty growths, eventually turning black, on the tubers, or rather on the sprouts, the growths being sometimes so numerous that they entirely cover the tubers. Sometimes called black scab, it must be distinguished from ordinary scab, which merely causes rough patches on the skin, and does not affect the flesh underneath. Scabby potatoes are, therefore, quite good for eating, but in order not to perpetuate the disease, they should not be used for planting. Of course, the most prevalent disease is the one which is known as *the* potato disease, due to the fungus *Phytophthora infestans.* The symptoms—the brown, grey-edged patches on the leaves, the subsequent blackening and decay of the haulm, the strong, unpleasant smell and the rotting of the tubers—

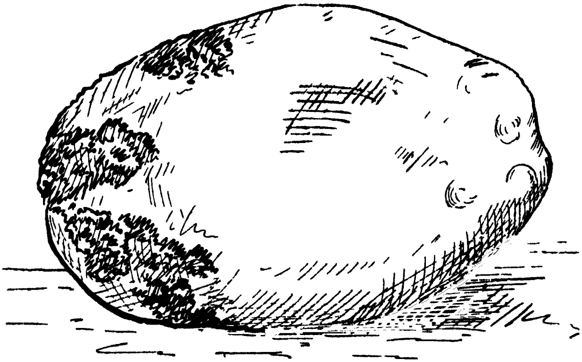

FIG. 44.—Potato affected by ordinary scab, merely a skin disease.

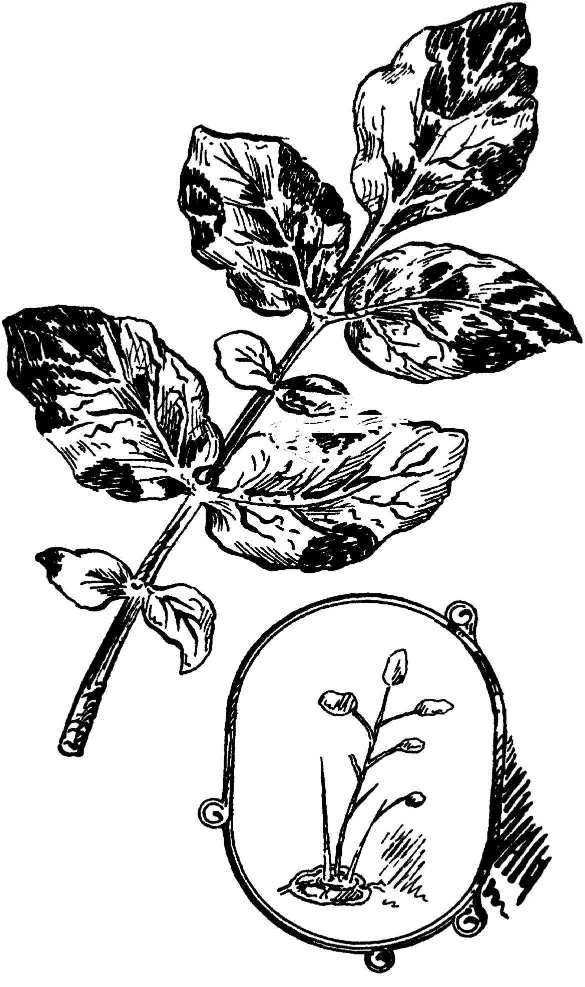

FIG. 45.—Potato Leaf diseased. Inset, the fungus (enlarged) growing through a stomate or pore.

are, unfortunately, familiar to every gardener. The infection of the young tubers can take place in two ways—by spores which fall from the blackened foliage and are washed down into the soil by rain, and by the mycelium which travels down from the leaves inside the haulm. In order to lessen the first danger, the ridges should be steep and smooth; the second can be averted by cutting off and burning the haulm before the mycelium reaches the tubers—that is, before the lower part of the haulm begins to change colour. The ripening process will go on in the ground if the weather is warm and dry, and in a few days, if the skins do not rub off easily, the tubers can be lifted and stored. Spraying with Bordeaux mixture is now largely resorted to as a preventive measure. The disease does not appear until the middle of July, and early in that month the haulm, especially underneath the foliage, should be thoroughly sprayed, the operation being repeated about three weeks later. As the early varieties mature about that time, they are seldom attacked severely, and on wet land or in gardens so shut in that there is a deficiency of fresh air, it is advisable to grow those varieties exclusively. Leaf-curl is another troublesome disease. The leaves curl in a way that cannot fail to attract attention, the haulm is stunted and afterwards blackened in patches, the old tubers remain as hard as when they were planted, and the young ones are very few and small. In this case experiments seem to show that spraying is useless. An application of some form of potash, such as kainit, has been found beneficial as a preventive; but the tubers used for planting must be free from the disease if the crop is to escape infection. Those lifted before they were ripe should be preferred, as the mycelium passing down the haulm does not reach them until they are mature. As leaf curl attacks tomatoes as well as potatoes, the disease in that case being called black stripe, these two members of the same family (*Solanum*) should not be grown on the same plot in successive years. In bacteriosis, brown streaks on the haulm extend gradually downwards, and when the tubers become affected, a dark ring will be found inside each, close to the skin, the interior crumbling away. Here, as in the common potato disease, the crop can be saved by lifting it while it still remains healthy. In blackleg, another bacterial disease, on the other hand, the infection commences in the ground and spreads upwards, the young tubers blackening first, and afterwards the haulm, the uppermost leaves being the last to wither. Nitrate, lime, and also cut "sets" are all said to increase the susceptibility to the disease. As blackleg attacks broad beans as well as potatoes, these crops should not follow one another on the same ground after an outbreak. Leaf-spot and leaf-blotch resemble the ordinary potato disease rather closely, and should be treated in the same way. There are also several diseases which develop in the tubers after they have been stored, the commonest being winter rot, characterised by sunken patches, on which white tufts afterwards appear, decay starting and spreading rapidly. None of these diseases can do much harm if potatoes are properly dried and ripened before they are put away. If they do break out owing to a neglect of this precaution, sulphur at the rate of 2 lbs. to the ton has been recommended for sprinkling among the tubers.

RADISH

(*Raphanus sativus*)

The Greek name used by Theophrastus was *Raphanos*, with which the Latin *Rapum* (turnip) and its diminutive *Rapulum* are connected. Horace and other Latin authors generally applied to the radish the word *Radix* (a root), which is the origin of the English name. The radish is believed to be a cultivated form of *R. raphanistrum*, a fairly common weed in cornfields, sometimes called the white-flowered charlock. The wild species is a native of Southern Europe, and is probably only naturalised here. According to Pliny, the radish was so highly esteemed by the ancient Greeks that in the Temple of Apollo, at Athens, it was represented in gold, the beet being merely in silver, and the turnip in lead. Heroditus states that it formed an important part of the food of the builders of the Pyramids. In those days it was apparently grown to a large size, whereas now we eat it only when it is young and small. It has been shown experimentally that the difference between the two forms—the tapering and the globular—is due to cultivation in different soils: light in the former case, and heavy in the latter.

The radish contains about 93 per cent. of water. Of the remaining 7 per cent., rather more than 1 and 4 per cent. consist of albuminoids and carbohydrates respectively, and ¾ per cent. of salts, the rest being indigestible fibre. The seed-pods are often used for pickling.

Varieties.—French Breakfast is one of the best early varieties, while Long Scarlet Short-top is largely grown for market. Black Spanish and China Rose are hardier, and therefore better for late autumn or winter.

Preparation of the Ground.—Deep soil is not as necessary for radishes as it is for most other crops; but as it should be rich and moist to ensure quick growth, an essential condition if the roots are to be crisp and mild-flavoured instead of tough, stringy, and pungent, it should be well manured. Occupying the ground only for a short time, radishes can be grown in such positions as the ridges between celery trenches. They can also be grown between rows of beet, carrots, and parsnips, as they will be ready before they are too much shaded by the other plants.

Cultivation.—An ounce of seed should be sufficient for a row 30 yds. in length. As it is necessary to use the roots while they are young, only a small quantity should be sown at one time, commencing as soon as the conditions are suitable in March. Additional sowings should be made about once a fortnight up to the end of July, when one of the hardier varieties should be used. The drill should be shallow and rather broad, and after the seed has been sown thinly in it, the soil should be raked smooth very carefully with the tips of the teeth. Unless the seed is protected by wire guards, black cotton, or some other device, it will all be eaten by birds. In summer, wire guards are much the best, because litter, sacking, or even paper can be laid over them to shade the ground, which is then less likely to be dried up in a short time. It is always best, even when the ground is moist, to water after sowing, as the top soil is then converted into a sort of paste, and is brought into close contact with every seed, thus promoting quick and even germination. Plenty of water should also be supplied during growth, and the hoe should be used at frequent intervals.

During the winter and early spring, radishes are often grown on hot-beds, generally with some other crop, such as carrots, lettuces, or early potatoes. In this case the more important crop is sown first, the radish seed being afterwards scattered broadcast, and raked in very lightly. The radishes mature before the others get tall, and are then cleared off.

Pests and Diseases.—Several insects feed on radishes, especially the larvæ of a small fly. They are not easy to get rid of, but spraying with weak paraffin emulsion may lessen the damage. For the fungoid disease, leaf-rot, which shows first as white downy patches underneath the leaves, spraying with a solution of liver of sulphur (½ oz. to 1 gal. of water) has proved beneficial. There is also a bacterial disease, black-rot, easily recognised by the blackened veins, the roots subsequently decaying inside. No cure is known. The affected plants should be pulled up, and burned.

SALSAFY

(*Tragopogon porrifolium*)

AND SCORZONERA

(*Scorzonera hispanica*)

Salsafy or salsify, as it is indifferently spelled, and scorzonera are grouped together because they are both roots, and require the same treatment. They are among the less common vegetables, being grown in comparatively few gardens. They deserve more general cultivation, for they come into use in winter, and salsafy in particular, when well cooked—boiled, and then cut into slices and fried with egg and breadcrumbs—has an excellent flavour, not unlike that of oysters, for which reason it is popularly known as the "vegetable oyster." Gerard describes it as "A most pleasant meate, and wholesome, in delicate taste farre surpassing either parsnips or carrots." It is a native of many European countries, but not of Britain, though in some districts it has become naturalised. It has a British relative, however, *Tragopogon arvensis*, the common goat's-beard of our meadows. The name salsafy is derived from the Italian *Sassefrica*, though why the plant should be called a rock-breaker is not clear.

Scorzonera, a native of Spain, owes its name (from *scurzon*, a serpent) to the fanciful resemblance of its black-skinned root to a snake. This association of ideas led to its being regarded as a remedy for snake-bite. In the sixteenth century it was not infrequently called viper's grass.

Varieties.—Though "improved" forms are listed in some catalogues, the fact that there are no named varieties of either salsafy or scorzonera is evidence of the small attention paid to them in gardens.

Preparation of the Ground.—As in the case of all tap-rooted vegetables, the ground should be deeply dug in autumn or winter. If possible, a position manured for a previous crop should be chosen, as fresh manure distributed about the soil is certain to cause the roots to fork. If it must be added because of the poverty of the land, it should be laid at the bottom of a trench, as advised under similar conditions for carrots and parsnips.

Cultivation.—An ounce of seed should be sufficient for a row 30 yds. in length. It should not be sown before the beginning of April, or, at the earliest, the end of March, otherwise the plants are liable to run to seed, especially if the summer happens to be very dry. The drills should be drawn 1 ft. apart, and the plants thinned to about 8 in. They only need an occasional hoeing. If any flowers appear, they should be picked off. In October the roots should be carefully lifted, and stored in the same way as carrots. But as scorzonera deteriorates if it gets very dry, it is best kept in moist sand.

SEAKALE

(*Crambe maritima*)

Seakale is a native of Britain and of other countries in Western Europe. One writer says: "The common people on some of the shores of England had long been in the practice of watching them (the plants) as they came through the sand, and using them as a pot-herb; but cultivation in the kitchen garden became common only at a comparatively recent date." Little, if any, seakale could be found wild on our shores at the present day. Pliny calls it *Halmyridia*, but in his time it does not seem to have been blanched, for he says that oil and·salt were used to preserve its green colour in the process of cooking.

Seakale contains about 2½ per cent. of albuminoids, nearly 3 per cent. of carbohydrates, and ½ per cent. of salts. The bitter principle which it has when grown in the light is prevented from developing by blanching.

Varieties.—There is only one variety, Lily-white, besides the common form. It is considered an improvement. Seakale (or silver) beet is merely a kind of beet of which the mid-ribs of the leaves are cooked and served like seakale, the other parts of the leaves being used as a substitute for spinach.

Cultivation.—If it is intended to start with seed, a small packet will supply enough plants for a private garden. It should be sown in drills, about 1 ft. apart, in March or April, and the young plants should be thinned to 6 or 8 in. Nitrate of soda at the rate of 4 oz. to 10 sq. yds. (or rather less of sulphate of ammonia) scattered around them in June will hasten their growth. During the summer they should be hoed several times, and kept free from weeds. In autumn, after the foliage withers, the roots can be lifted and laid in a trench until spring; or if the ground is not wanted, they may remain where they are if they are protected with ashes or a little soil. At the end of March, after the crowns have been sliced off in order to prevent their running to seed, they should be planted about 1 ft. apart, with 2 ft. between the rows, the top of each root 1 or 2 in. below the surface. By the end of the season, especially if they have been well supplied with liquid manure, they should have grown into large plants, and from November onwards those required for forcing can be lifted and used for the purpose. At the same time, any side roots should be trimmed off and planted out for growing to a larger size in the same way as one-year-old plants from seed.

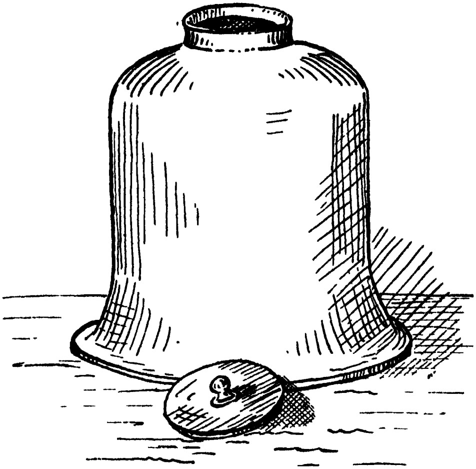

FIG. 46.—Seakale Pot.

The roots left in the ground may be allowed to develop at their own time, or they may be brought on some weeks sooner by piling fresh manure around them. In either case the leaf-stalks must be blanched. This is done by covering the crowns with ordinary seakale pots, or large flower pots with pieces of slate laid over the holes, or boxes, or even mounds of ashes. When the stalks are about 9 in. high, they should be cut off with a small slice of the root attached.

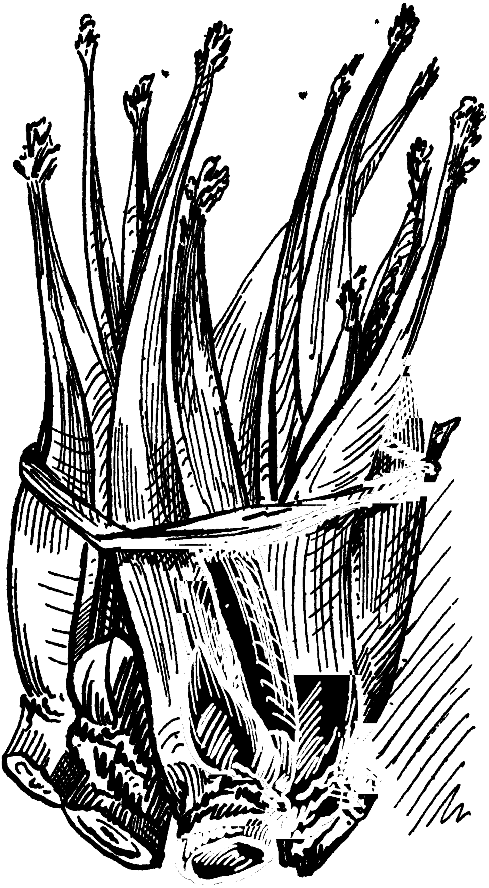

FIG. 47.—Seakale blanched and cut.

The coverings should also be removed. New crowns soon form, and should be allowed to grow during the remainder of the season in order to strengthen the plants. The roots are not infrequently left undisturbed until they are worn out, but it is best to make a fresh plantation every year by means of plants grown from root trimmings.

The commonest method of forcing is to pack a number of roots rather close together in boxes of light, moist soil, and at intervals during the winter to place them in the greenhouse. They can stand anywhere, even under the stage; but in order to exclude the light and also to keep off drip, they must be covered. After they have served their purpose, they can be planted out in the open ground with the object of supplying fresh plants.

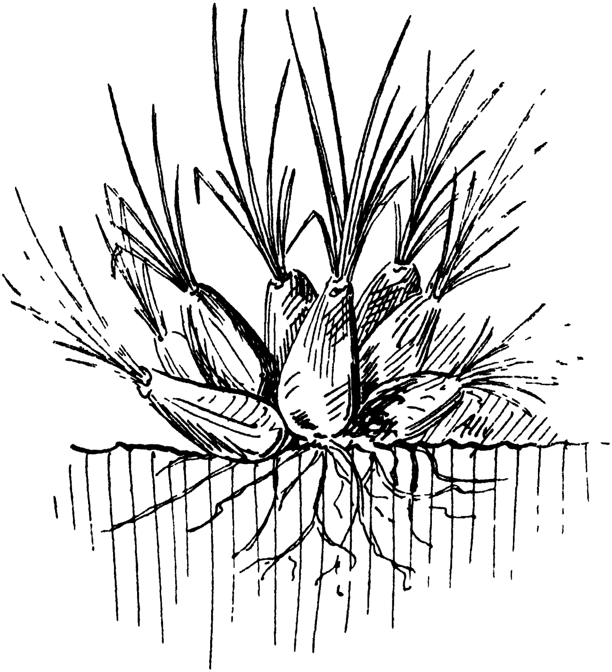

FIG. 48.—Cluster of Shallots.

In private gardens seakale is not often grown from seed. In order to save time, plants are obtained from a nurseryman or seedsman.

Pests and Diseases.—Seakale is rarely attacked by any serious disease, nor are insects troublesome. Any in the ground can be cleared away by an application of common salt, which is a good dressing for seakale, just as it is for asparagus.

SHALLOT

(*Allium ascalonicum*)

The shallot, a native of Palestine, is one of the less common vegetables in English gardens. The bulbs, or cloves as they are often called, are used for flavouring or pickling, and the leaves in salads instead of young onions. There are several varieties—the ordinary shallot, the Russian, and the Jersey. The first is the smallest but the best flavoured, and does not quickly run to seed like the others. Seed can be sown in spring, but, in order to save time, propagation is generally effected by means of the bulbs, which should be planted about the end of February—6 in. apart, with 1 ft. between the rows. They should be merely pressed into the ground until they are just below the surface. A dressing of soot is useful in helping growth and keeping away insects. Early in July, if not before, the leaves wither. Every bulb will then be found to be the centre of a cluster. They should be taken up, separated, thoroughly dried in the sun, cleaned, and stored like onions.

SPINACH

(*Spinacea oleracea*)

Spinach is supposed to have been brought by the Arabs from Western Asia to Spain, and to have spread from that country over Europe. The date of its introduction into Britain is given in some works as 1568, but in that year it was already in cultivation, though still a novelty. According to Gerard, whose "Herbal" was published at the end of the century, it was then eaten raw in salads, and also boiled as a vegetable. The name is derived from the Latin word *spina*, in reference to the prickly fruits of some varieties.

Spinach contains nearly the same amount of albuminoids as of carbohydrates—rather over 3 per cent. Its value is largely medicinal, due to 2 per cent. of salts.

Varieties.—The round-seeded varieties are generally preferred for summer, Victoria being one of the best. Monstrous Viroflay grows very large. The prickly-seeded, being hardier, are sown for winter or early spring. New Zealand spinach is a different plant altogether, its botanical name being *Tetragonia expansa.* It is useful in a dry summer as a substitute for spinach, which, under such conditions, quickly runs to seed, and being a perennial it will supply leaves for a number of years. Another substitute, Orache or Mountain spinach (*Atriplex hortensis*), is an annual, which must be used while quite young. There is a variety with red leaves. Yet another substitute is Perpetual or Spinach Beet. See also Seakale (Varieties).

Preparation of the Ground.—The Hadlow experiments show the advantage of digging in stable manure at the rate of twenty-five loads per acre, supplementing it with from 4 to 6 cwt. of superphosphate, and applying during growth nitrate of soda in successive dressings of 2 cwt. up to a total of 6 cwt., or its equivalent of sulphate of ammonia. Potash was not found to be necessary. Good crops were also grown with the artificials alone in the quantities mentioned, but in this case potash (1 cwt. of the sulphate or 4 cwt. of kainit) had to be added. To lessen the risk of summer spinach running to seed, a partially shaded position should be chosen for it—*e.g.*, between tall peas or beans.

Cultivation.—An ounce of seed should be sufficient for a row 30 yds. in length. It should be sown in drills 1 in. deep and 1 ft. apart, the first sowing being made as soon as the weather and the soil will permit in March, and others at fortnightly intervals throughout the season. The winter varieties should be sown about the middle of August, and again early in September. The young plants should be thinned to a distance of 6 in. It is essential to keep them growing without check, otherwise even when quite small they will begin to form flower-heads. An abundance of moisture is therefore essential, and weak liquid manure should be grown frequently. The hoe should be kept going among them; it will not only benefit them, but also reduce the number of insects. When the crop is ready, it is best to pick straight along the rows and then to clear the ground.

Pests and Diseases.—Spinach is liable to be attacked by several fungoid diseases, the commonest being mildew (greyish-blue spots underneath the leaves) and leaf-spot (pale yellowish spots, which gradually darken). In all such cases the plants should be pulled up and burned. The most troublesome insects are ground caterpillars. They injure the stems at the level of the ground, and the plants flag more or less suddenly, and die. If a little soil is scraped away from a plant showing signs of distress, the insect can usually be found.

TOMATO

(*Lycopersicum esculentum*)

The tomato is a native of South America, and was introduced into this country in 1596. It was then a ribbed fruit; the smooth globular form of the present day is the result of cultivation and selection. The botanical name, signifying literally the edible wolf-peach—*i.e.*, the inferior peach—is rather absurd, for the two fruits are so different in every respect that no comparison between them is possible. The popular name had probably the same Indian origin as that of the potato—*batatas*. In old gardening books it is almost invariably called the Love-Apple. It did not become an important vegetable in England until about the middle of the nineteenth century.

The tomato contains about 1½ per cent. of albuminoids, over 6½ per cent. of carbohydrates, and ¾ per cent. of salts, 90 per cent. being water.

Varieties.—There are very many varieties, and every year adds to their number. Kondine Red, Carter's Sunrise, Tresco, and Marvel of the Market are all largely grown. Golden Nugget is a good yellow-fruited variety.

Preparation of the Ground.—For outdoor tomatoes a warm and sheltered position should be chosen. As they are liable to be attacked by some of the same diseases as potatoes, it should be one in which the latter crop was not grown in the previous year. The ground should be deeply dug, but only moderately manured. If manure is present in large quantities, the plants are apt to grow so luxuriantly that they bear comparatively little fruit. The time to feed them is when the fruit is set and beginning to swell.

Cultivation.—A small packet of seed is sufficient for most gardens. It should be sown thinly in a box of light soil in a warm greenhouse (temperature from 55° to 60° F.) in January or February for an early crop, and under the same conditions in March for a later one. When the seedlings have made their second pair of leaves they should be planted separately in small pots (sixties) of sandy loam, with a little leaf mould. This is better than pricking them out in boxes, as it avoids subsequent disturbance of the roots. They should be kept near the glass to prevent their being drawn up, and when they require more space they should be transferred to larger pots. Each time they are moved they should be planted a little deeper, for they emit roots along the stems and not merely from the joints, and these additional roots help to strengthen them. If cuttings are available they will make strong plants sooner than seeds. Short side shoots inserted firmly in sandy soil, and kept moist and shaded, will quickly root in a warm greenhouse.

When tomatoes are to be grown under glass, they should eventually be planted either in tubs or boxes, or in the beds prepared for them, the usual distance between them being about 18 in. When tubs or boxes are used, they should not be quite filled: space should be left for a top-dressing later. If possible, tomatoes should have a house to themselves. The attempt is not infrequently made to grow them under vines,

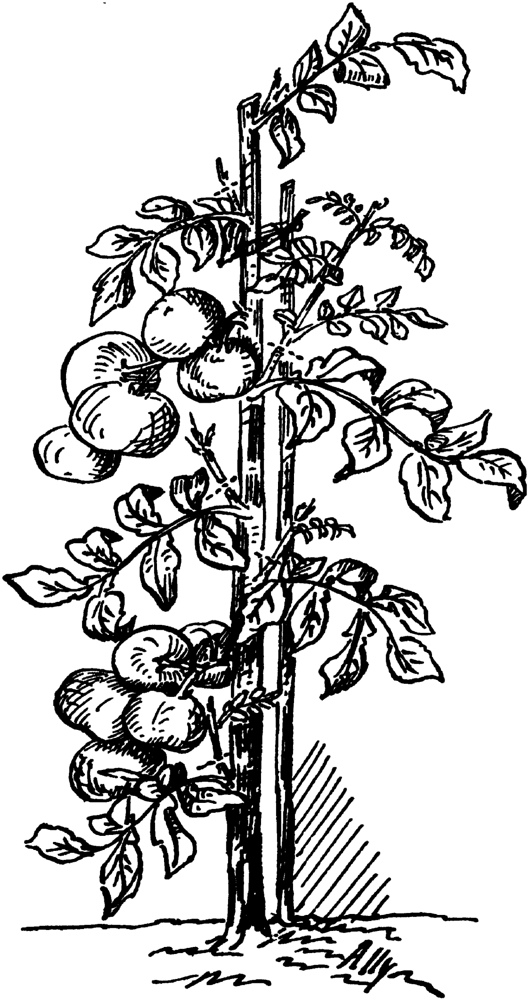

FIG. 49.—Outdoor Tomato carrying two bunches.

but it is rarely successful. Even if they are not too heavily shaded, they require a dry atmosphere, whereas a moist one is necessary for vines. The plants should be trained to stakes or wires, and each should be kept to a single stem, all side shoots being pinched off. In the case of very early or very late crops, when few insects are about, the blossoms should be pollinated by passing a camel-hair brush lightly over them; but at other seasons this is not necessary. When the first bunch or two begin to swell, a rich top dressing may be laid round the stems, and weak liquid manure applied every few days. Water should be given only when it is required—when the soil shows signs of getting dry—and it should never be poured over the foliage. Plenty of fresh air is essential. The lights should be kept open during the greater part of the day in summer, and until the weather becomes cold may be left open a little at night. A damp, stagnant atmosphere is sure to induce disease. If the fruits are too much shaded by the foliage when they begin to change colour, a portion of a leaf here and there may be taken off; but the less this is done, the better. In order to prolong the period of bearing, they should be gathered as soon as they are ripe, if not a little before. They will finish colouring if laid on a greenhouse shelf or even in a sunny window.

Tomatoes for the open air should be hardened off in a cold frame about the middle of May, and planted out early in June. The best position is against a south wall; but in warm districts, unless the summer should be cold and wet, they will do fairly in any sunny corner if they are supported by stakes. The method of cultivation is the same as for plants under glass, but the bearing period is necessarily shorter, and in August the shoots should be stopped and no further growth allowed, in order to concentrate the sap in the fruits already formed. In October, all the fruits should be gathered. Many will ripen in a greenhouse or a sunny window; the others that are still small and green can be used for pickling.

Pests and Diseases.—The only insects which attack

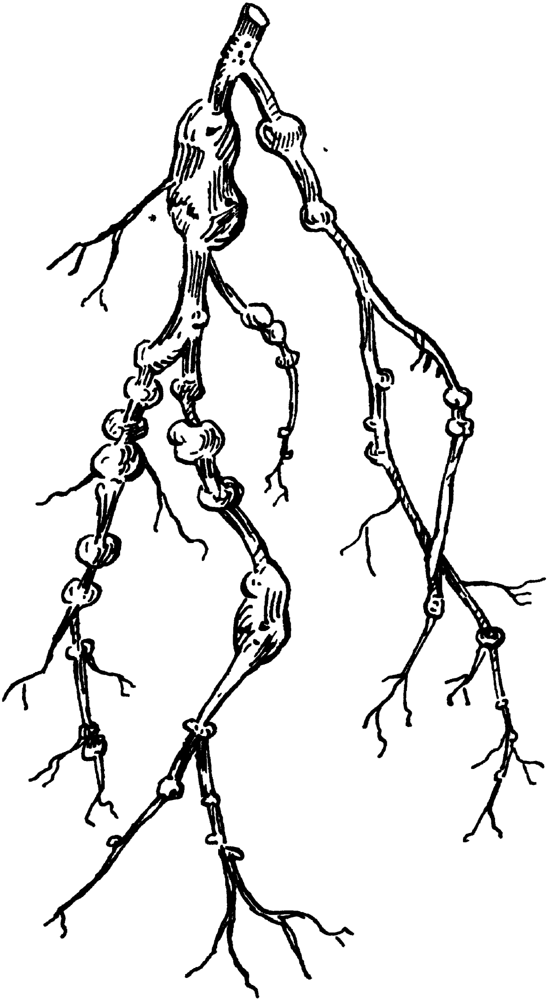

FIG. 50.—Tomato Roots attacked by eelworms.

the tomato are the snowy fly and eelworms. In glasshouses —never in the open air—the former is sometimes a very troublesome pest, piercing the leaves and sucking the juices, and so weakening the plants. The remedy is vaporisation. There are various suitable preparations on the market. Eelworms, creatures of microscopic size, are still more destructive. The affected plants make very poor growth, and presently die, and the roots, when examined, are found to have numerous knots or swellings. A heavy dressing of sulphate of potash (about 1½ oz. to 1 sq. yd.) is said to be beneficial. Eelworms are terribly infectious, and any soil containing them, whether in pots, boxes, or frames, should not be used again for any purpose or distributed about the garden until it has first been sterilised by baking or by treating with carbolic acid at the rate of 2 oz. to 1 cub. ft. Among fungoid diseases, canker can be distinguished by the wilting of the leaves, and the dark or grey colour of the lower joints from which, at a later stage, gum exudes. For sleeping sickness no cure is known. The leaves flag more or less suddenly, and the upper part of the stems droop, the plants dying in a short time, just as if they had been eaten through by some insect. They should be burned, and the soil disinfected. Black, roughened patches, often with cracks on the fruits, are due to scab. It can be prevented from spreading by spraying with a solution of liver of sulphur (½ oz. to 1 gal. of water). For the three following diseases, a stronger liquid—Bordeaux mixture—must be used, and even it may be ineffectual after the early stages are past: leaf-mould, dark green spots, arranging in circles and soon coalescing on fruits, stems, and leaves, which quickly wither; leaf-rust, brown felted spots on the leaves, and afterwards on the stems and fruits; and black-rot or black-stripe, black patches on the fruits and black streaks on the stems. This last disease is due to the same fungus as causes leaf-curl in the potato.

TURNIP

(*Brassica rapa*)

Brassica campestris, the species which is supposed to be the origin of the turnip, is a native of Britain and of other countries in Europe and also in Asia. "It is a biennial," says Lord Avebury in "British Flowering Plants," "and during the first year, when the stem remains very short, the plant occupies itself by laying in a stock of nourishment in the underground root formed from the portion of the original stem between the cotyledons and the upper part of the primary root. In the following year the erect, leafy, and flowering stem is produced at the expense of the store." In the turnip this portion of the root has been greatly enlarged by long cultivation in rich soil, and the plant is lifted before it can expend its store—that is, before it flowers. In India it has been cultivated from very distant times, and it was a common vegetable of the ancient Greeks and Romans. Pliny says that the Greeks had discovered how to modify its shape, the roots being more elongated in light land than in clay, as also happens with carrots. The Swedish turnip, commonly called the Swede, may have been derived from the same species, or possibly from another. It was unknown in this country until nearly the end of the eighteenth century, but since then, being very hardy, it has been largely grown in Scotland and the North of England. In the South it was long regarded merely as a food for cattle, and its value as a vegetable was not recognised until quite recently. The garden variety is smaller than the field Swede, and not so coarse in texture. By many it is considered superior in flavour to the ordinary turnip.

Varieties.—Early Snowball is a good white-fleshed variety, and Orange Jelly a good yellow. For late use Red Globe (one of the hardiest) and the Garden Swede are available.

Preparation of the Ground.—Turnips are not often wanted before autumn or winter, and, if not sown until May or June, they have much more chance of escaping the attacks of that troublesome pest, the turnip flea. They are generally grown on land occupied earlier in the season by deep-rooting crops, such as peas or beans. Under such circumstances the plot, after having been cleared, is merely forked over, levelled, and raked smooth. If at the same time a dressing of superphosphate (at the rate of 6 lbs. to the rod) and potash (at the rate of ½ lb.) is scattered on the surface, it will benefit the

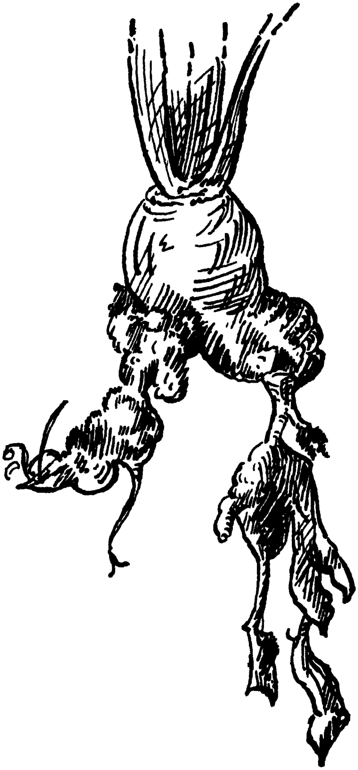

FIG. 51.—Club-Root of Turnip ("finger-and-toe").

young plants when they appear, and with a sprinkling of nitrate of soda (at the rate of 6 oz.) or rather less of sulphate of ammonia, when they get their rough leaves, they will grow rapidly.

Cultivation.—An ounce of seed should be sufficient for a row 100 yds. in length. It should be sown thinly in shallow drills about 1 ft. apart. If turnips are wanted in summer, a commencement may be made in March; but only a little seed should then be sown at a time, as the early crops are liable to be destroyed by the turnip flea, especially in a dry season, and the plants not infrequently run to seed. The latest sowings should be made at the end of July or the beginning of August. The larger kinds, such as Red Globe and the Swede, should be thinned to about 8 in. apart; but half that distance is sufficient for the smaller, such as Snowball. The hoe should be used frequently among them, and water applied in dry weather. Late turnips and Swedes may be stored like other roots, or left in the ground until they are wanted. In early spring the young tops are often used as a substitute for cabbages.

Pests and Diseases.—The pests of the turnip are, unfortunately, numerous. They include slugs, wireworms, millipedes, surface caterpillars, aphides, the turnip flea, and the larvæ of the turnip sawfly, the turnip gall weevil, and various other insects. Against those that live in the soil, not very much can be done; but the hoe will expose many of them to birds, and keep others on the move. Dressings of soot and lime are useful. For aphides the plants should be sprayed with an insecticide, such as soapy water, containing a little nicotine. Caterpillars, which eat the leaves, should be picked off by hand. Many of the sawflies—tiny, yellowish flies—can be caught in a butterfly net passed rapidly over the rows. If they are left undisturbed, their larvæ may prove as destructive as the turnip fleas, some of which can be caught in the same way. The worst of the fungoid diseases is club-root, or finger-and-toe, as it is often called when it deforms turnips. Lime is useful as a preventive. All affected plants should be burned. Other fungoid diseases are white mildew (seldom very serious), leaf-rot (dark, downy patches spreading rapidly on the leaves, and causing them to decay), and sclerotinia (white mould near the ground level, and extending upwards, the leaves turning yellow). In the first two cases, spraying with a solution of liver of sulphur (½ oz. to 1 gal. of water) may be tried, but the last is incurable. There are also two bacterial diseases—black-rot (the veins of the leaves turning black, and the roots decaying internally) and blackleg, the same disease as attacks potatoes, the symptoms very similar. All affected plants should be burned.

VEGETABLE CALENDAR

(The letters *b*, *m*, and *e* signify the beginning, middle, and end of the month respectively.)

JANUARY

Sow outside—Broad beans.

Sow in heat—Dwarf beans, carrots, cucumbers, leeks, mustard and cress, onions, radishes, and tomatoes.

Dig and manure all vacant ground.

Force asparagus and seakale.

Insert mushroom spawn in beds prepared in December (*b*).

Protect broccoli forming hearts by bending leaves over them.

Sprout early potatoes in boxes, and plant in hot-beds.

Look over stored potatoes, beet, and other roots and tubers.

Make a rough plan of the kitchen garden, and mark on it where the different crops are to grow, so as to ensure a proper rotation.

In season—Artichokes, asparagus (forced), beet, broccoli, Brussels sprouts, cabbage, cardoons, carrots, celeriac, celery, endives, herbs, horse-radish, kale, kohl rabi, leeks, lettuce (frame), mustard and cress, onions, parsley, parsnips, potatoes, radishes (frame), salsafy, savoys, scorzonera, seakale (forced), shallots, spinach, and turnips.

FEBRUARY

Sow outside—Broad beans, carrots (in warm border), parsley, parsnips (*b*), and peas.

Sow in heat—Brussels sprouts, carrots, cauliflowers, cucumbers, leeks, lettuce, mustard and cress, radishes, and tomatoes.

Plant cabbages and shallots.

Lift and replant Jerusalem artichokes.

Lift and store any parsnips still left in the ground.

Finish digging and manuring vacant plots.

Force seakale in the open ground.

Sprout early potatoes (*b*). In dry soil and a warm position, a row or two may be planted about 6 in. deep (*e*).

In season—Artichokes, asparagus (forced), beet, broccoli, Brussels sprouts, carrots, celeriac, celery, endives, herbs, horse-radish, kale, leeks, lettuce (frame), mushrooms, mustard and cress, onions, parsley, parsnips, potatoes, radishes (frame), salsafy, savoys, scorzonera, seakale (forced), and turnips.

MARCH

Sow outside—Broad beans, broccoli, Brussels sprouts, cabbage, carrots (*e*), cauliflowers, corn salad, herbs, kale, leeks (*b*), lettuce, mercury, mustard and cress, onions, parsley (*b*), parsnips (*b*), peas, radishes, savoys, seakale, and spinach.

Sow under glass, preferably in heat—Globe artichokes, cardoons, celeriac, celery, cucumbers, marrows, and tomatoes.

Mix asparagus with moist sand.

Prick out seedling Brussels sprouts and other cabbages.

Plant Chinese and Jerusalem artichokes and offsets of Globe, cauliflowers, chives, horse-radish, lettuce, onions (autumn sown and from boxes), potatoes (*m* to *e*), and seakale.

Propagate herbs by division.

Dig celery trenches.

In season—Beet, broccoli, cabbage, carrots (old and forced), herbs, horse-radish, leeks, lettuce, mushrooms, mustard and cress, onions, parsley, parsnips, potatoes, radishes, salsafy, seakale, shallots, spinach, and turnips.

APRIL

Sow outside—Asparagus (*e*), French beans (*e*), broccoli, cabbage, cardoons, carrots, celeriac, celery, chicory (*e*), kale, kohl rabi, leeks, lettuce, mustard and cress, onions, peas, salsafy, scorzonera, seakale, shallots, and turnips.

Sow under glass—Cucumbers, maize, and marrows.

Prick out seedling cabbages of various kinds, celeriac, and celery.

Plant Globe artichokes, asparagus (*b*), cauliflowers, leeks, and potatoes.

Dress asparagus beds with salt and soot.

Spray carrots to keep off the carrot fly.

Thin all growing crops.

In season—Asparagus, French beans (forced), beet, broccoli, cabbage, carrots, cauliflowers, chicory, chives, herbs, horse-radish, lettuce, mercury, mustard and cress, onions, parsley, potatoes, radishes, seakale, spinach, and turnips.

MAY

Sow dwarf and runner beans, beet, broccoli, carrots, chicory, ridge cucumbers (under handlights), endive, kohl rabi, lettuce, maize, marrows, mustard and cress, onions (for salads), peas, radishes, spinach, and turnips.

Plant seedling Globe artichokes, broccoli, Brussels sprouts, cabbage, cauliflowers, celeriac, celery (*e*), maize (*e*), marrows (*e*), potatoes (if necessary), and seakale.

Plant tomatoes in greenhouses, and cucumbers in frames.

Insert mushroom spawn in lawns and meadows.

Apply nitrate or soot to potatoes, and earth up.

Hoe, weed, and thin growing crops.

In season—Asparagus, dwarf beans (forced), broccoli, cabbage, mercury, carrots, cauliflowers, chicory, chives, herbs, horse-radish, lettuce, mushrooms, mustard and cress, onions, parsley, potatoes, radishes, seakale, spinach, and turnips.

JUNE

Sow dwarf and runner beans, carrots, endive, lettuce, mustard and cress, peas (dwarf), radishes, and turnips.

Plant broccoli, Brussels sprouts, cauliflowers, celeriac, celery, ridge cucumbers, kale, leeks, maize, marrows, and tomatoes.

Insert mushroom spawn in lawns and meadows (*b*).

Cease cutting asparagus, mercury, and seakale (*b* to *m*).

Pinch tops off broad beans, and, if necessary, syringe for black fly.

Lift early potatoes as required, and earth up late varieties.

Hoe and water in dry weather.

Apply liquid manure or nitrate to growing crops.

In season—Globe artichokes, asparagus (*b*), broad beans, cabbage, carrots, cauliflowers, chives, herbs, horse-radish, lettuce, mercury (*b*), mustard and cress, onions, parsley, peas, potatoes, radishes, spinach, tomatoes, and turnips.

JULY

Sow dwarf beans, carrots, endive (*m*), lettuce, mustard and cress, onions (for salads), parsley, radishes, and turnips.

Plant broccoli, cabbage, cardoons, cauliflowers, kale, and leeks.

Make up beds for mushrooms (*e*), and insert spawn among cucumbers.

Pinch tops off broad beans.

Lay onions when the foliage begins to change colour.

Lift shallots.

Gather and dry herbs for winter.

Train tomatoes.

Spray potatoes (*b* and *m*).

Hoe, water, and manure growing crops.

In season—Globe artichokes, beans, cabbage, carrots, cauliflowers, chives, herbs, horse-radish, lettuce, mustard and cress, onions, parsley, peas, potatoes, radishes, spinach, tomatoes, and turnips.

AUGUST

Sow cabbage, cauliflowers (*e*), endive, lettuce, onions, spinach, and turnips (*b*).

Insert mushroom spawn in prepared beds.

Spray potatoes.

Hoe in dry weather, and water.

Clear off all crops when ready, and use the ground for others.

In season—Artichokes, beans, beet, cabbage, cardoons, carrots, cauliflowers, corn salad, cucumbers, endive, herbs, horse-radish, kohl rabi, lettuce, maize, marrows, mushrooms, mustard and cress, onions, parsley, peas, potatoes, radishes, spinach, tomatoes, and turnips.

SEPTEMBER

Sow endive, lettuce, mustard and cress, radishes, and spinach.

Plant cabbages.

Earth up cardoons.

Cut down old parsley (*b*) to make it sprout afresh.

Lift onions and potatoes as soon as the tops wither.

In season—Artichokes, beans, beet, cabbage, cardoons, carrots, cauliflowers, corn salad, cucumbers, endives, herbs, horse-radish, kohl rabi, lettuce, maize, marrows, mushrooms, mustard and cress, onions, parsley, peas, potatoes, radishes, shallots, spinach, tomatoes, and turnips.

OCTOBER

Sow in greenhouse or frame—Mustard and cress and radishes.

Plant cabbages.

Move endive, lettuce, and young cauliflowers to a frame.

Lift and store beet, carrots, celeriac, potatoes, salsafy, and scorzonera.

Earth up cardoons, celery, and leeks.

Fork over asparagus beds, and dress with manure.

Protect seakale crowns with ashes.

Gather all marrows and outdoor tomatoes.

In season—Artichokes, beans, beet, broccoli, Brussels sprouts, cabbage, cardoons, carrots, cauliflowers, celeriac, corn salad, cucumbers, endive, herbs, horse-radish, kohl rabi, leeks, lettuce, maize, marrows, mushrooms, mustard and cress, onions, parsley, parsnips, peas (in mild season), potatoes, radishes, shallots, spinach, tomatoes, and turnips.

NOVEMBER

Sow in heat—Mustard and cress and radishes.

Sow outside—Broad beans.

Earth up cardoons, celery, and leeks.

Heel over broccoli, and draw soil round cabbages.

Cut down asparagus, fork over the beds, and dress with manure.

Protect Globe artichokes with litter.

Give air to cauliflowers and lettuces in frames, and move in more lettuces as space falls vacant.

Break up and distribute hot-beds.

Dig or trench and manure all vacant ground.

In season—Artichokes, beet, broccoli, Brussels sprouts, cabbage, cardoons, carrots, celeriac, celery, endive, herbs, horse-radish, kale, kohl rabi, leeks, lettuce, mushrooms, mustard and cress, onions, parsley, parsnips, potatoes, radishes, salsafy, shallots, spinach, and turnips.

DECEMBER

Sow in heat—Mustard and cress and radishes.

Force asparagus, chicory, and seakale.

Make up hot-beds for mushrooms (*e*).

Move parsley to a frame or greenhouse.

Give air on fine days to plants under glass.

Store a supply of parsnips and turnips at the approach of hard weather.

Burn all hard-wooded rubbish, and distribute the ashes about the ground. Fallen leaves and other vegetable refuse that will readily decay should be kept in a separate heap.

Dig or trench and manure any plots still vacant.

In season—Artichokes, beet, broccoli, Brussels sprouts, cabbages, cardoons, carrots, celeriac, celery, chicory, endive, herbs, horse-radish, kale, kohl rabi, leeks, lettuce, mustard and cress, onions, parsley, parsnips, potatoes, radishes, salsafy, savoys, seakale, shallots, and turnips.

Printed in Great Britain at THE DARIEN PRESS, *Edinburgh*